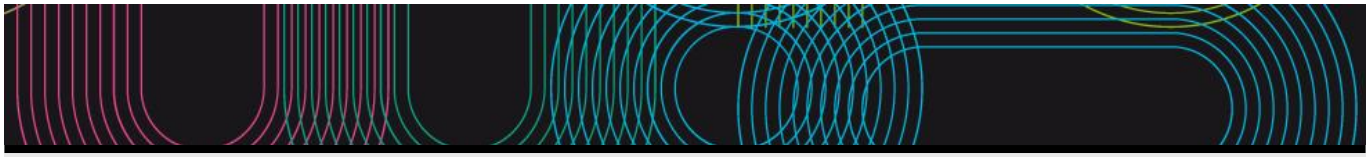

(*)Escola de Enxeñaría Industrial

Information
For additional information about the centre and its degres visit the centre's website https://eei.uvigo.es/

Grado en Ingeniería Mecánica

Subjects

Year 1st

Code	Name	Quadmester	Total Cr.
V12G380V01101	Graphic expression: Graphic expression	1st	9
V12G380V01102	Physics: Physics I	1st	6
V12G380V01103	Mathematics: Algebra and statistics	1st	9
V12G380V01104	Mathematics: Calculus I	1st	6
V12G380V01201	Business: Introduction to business management	2nd	6
V12G380V01202	Physics: Physics II	2nd	6
V12G380V01203	Computer science: Computing for engineering	2nd	6
V12G380V01204	Mathematics: Calculus II and differential equations	2nd	6
V12G380V01205	Chemistry: Chemistry	2nd	6

Year 2nd

Code	Name	Quadmester	Total Cr.
V12G380V01301	Materials science and technology	2nd	6
V12G380V01302	Thermodynamics and heat transfer	1st	6
V12G380V01303	Fundamentals of electrical engineering	1st	6

Year 3rd

Code	Name	Quadmester	Total Cr.
V12G380V01304	Machine design I	2nd	6

Year 2nd

Code	Name	Quadmester	Total Cr.

V12G380V01305	Fundamentals of manufacturing systems and technologies	1st	6
V12G380V01306	Mechanism and machine theory	1st	6
V12G380V01401	Environmental technology	1st	6
V12G380V01402	Resistance of materials	2nd	6
V12G380V01403	Fundamentals of automation	2nd	6
V12G380V01404	Electronic technology	2nd	6
V12G380V01405	Fluid mechanics	2nd	6

Year 3rd

Code	Name	Quadmester	Total Cr.
V12G380V01501	Thermal engineering I	1st	9
V12G380V01502	Elasticity and additional topics in resistance of materials	1st	9
V12G380V01504	Materials engineering	1st	6
V12G380V01505	Fluid machines	1st	6
V12G380V01601	Basics of business management	2nd	6
V12G380V01602	Graphic engineering	2nd	6
V12G380V01603	Theory of structures and industrial constructions	2nd	6
V12G380V01604	Manufacturing engineering and dimensional quality	2nd	6

Year 4th

Code	Name	Quadmester	Total Cr.
V12G380V01701	Technical Office	1st 2nd	6
V12G380V01902	Electrical components in vehicles	2nd	6
V12G380V01903	Technical English I	2nd	6
V12G380V01904	Technical English II	2nd	6
V12G380V01905	Methodology for the preparation, presentation and management of technical projects	2nd	6
V12G380V01906	Advanced programming for engineering	2nd	6
V12G380V01907	Industrial safety and hygiene	2nd	6
V12G380V01908	Laser technology	2nd	6
V12G380V01911	Machine design II	1st	6
V12G380V01912	Materials and technologies in mechanical manufacturing	1st	9
V12G380V01913	Thermal engines and machines	1st	9
V12G380V01914	Design of hydraulic machines and oleo-pneumatic systems	2nd	6
V12G380V01915	Computer-aided mechanical design	2nd	6

V12G380V01921	Concrete structures	1st	6
V12G380V01922	Metal structures	1st	6
V12G380V01923	Electrical installations, surveying and construction	1st	9
V12G380V01924	Thermal and fluid installations	1st	9
V12G380V01925	Additional topics in structures and foundations	2nd	6
V12G380V01931	Product design and communication, and automation of plant elements	1st	9
V12G380V01932	Materials selection, tools and manufacturing resources	1st	9
V12G380V01933	Systems for data analysis, simulation and validation	1st	6
V12G380V01934	Systems for product design and development	2nd	6
V12G380V01935	Advanced manufacturing technologies	2nd	6
V12G380V01941	Automobiles and railways	1st	6
V12G380V01942	Fluidmechanic systems and advanced materials for transportation	1st	12
V12G380V01943	Powertrain systems	1st	6
V12G380V01944	Hybrid and electric automotive vehicles	2nd	6
V12G380V01945	Transport engineering	1st	6
V12G380V01981	Internships: Internships	2nd	6
V12G380V01991	Final Year Dissertation	2nd	12
V12G380V01999	Internships/elective courses	2nd	6

IDENTIFYING DATA				
Graphic expression: Graphic expression				
Subject	Graphic expression: Graphic expression			
Code	V12G380V01101			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	9	Basic education	1st	1st
Teaching language				
Department				
Coordinator	Troncoso Saracho, José Carlos Fernández Álvarez, Antonio			
Lecturers	Alegre Fidalgo, Paulino Comesaña Campos, Alberto Corralo Domonte, Francisco Javier Fernández Álvarez, Antonio González Rodríguez, Elena Patiño Barbeito, Faustino Troncoso Saracho, José Carlos			
E-mail	antfdez@uvigo.es tsaracho@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	The aim that pursues with this subject is to form to the student in the thematic relative to the Graphic Expression, so as to prepare for the handle and interpretation of the systems of representation more employed in the industrial reality and his basic technicians, enter him to the knowledge of the forms, generation and properties of the geometrical entities more frequent in the technician, including the acquisition of vision and space understanding, initiate him in the study of the appearances of technological character that influence in the Graphic Expression of the Engineering and enter him rationally in the knowledge and application of the Normalisation, so much in his basic appearances as in the specific. The subject will develop so that prepare to the student for the indifferent employment of traditional technicians and of new technologies of the information and communications.			

Competencies
Code
CG3 CG3 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.
CG4 CG4 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.
CG6 CG6 Capacity for handling specifications, regulations and mandatory standards.
CE5 CE5 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.
CT2 CT2 Problems resolution.
CT6 CT6 Application of computer science in the field of study.
CT9 CT9 Apply knowledge.

Learning outcomes	Competences		
- Know, understand, and apply a body of knowledge about the basics of drawing and standardization of industrial engineering, in its broadest sense , while promoting the development of space capacity.	CG3 CG4	CE5	CT2 CT6
Purchase the capacity for the abstract reasoning and the establishment of strategies and efficient procedures in the resolution of the graphic problems inside the context of the works and own projects of the engineering.	CG3 CG4	CE5	CT2
Use the graphic communication between technicians, by means of the realisation and interpretation of planes in accordance with the Norms of Technical Drawing, involving the use of the new technologies.	CG6	CE5	CT6 CT9
Assume a favourable attitude to the permanent learning in the profession, showing proactive, participatory and with spirit of improvement.	CG4		CT9

Contents
Topic

Block 0. Computer-aided drawing 2D. Sketching, and application of Norms.	Introduction to the Computer-aided Drawing. Surroundings of work. Systems of Coordinates. You order of Drawing. Graphic entities. Helps to the drawing. References to entities. You order of Modification. You order of Visualisation. You order of Query. Impression and scales. 0.2. Sketching, and application of Norms
Block I 2D. Flat geometry.	I review of previous knowledges. Conical: definitions, focal and main circumferences, tangent line and normal in a point, tangent lines from an external point, own and improper. Tangencies between straight and circumferences and between circumferences (26 cases). Tools of resolution: geometrical places, operations of dilatation and investment and power. Technical curves: Trochoids: definition, traced and tangent line in a point. Other technical curves.
Block II 3D. Systems of representation.	Introduction: Types of projections. Invariants *proyectivos. System *Diédrico: Foundations. Belonging and Incidence. Parallelism and *Perpendicularidad. Distances, Angles. Operations: Twists, Changes flatly and *Abatimientos. Surfaces: Polyhedral, Irradiated and of Revolution, Surfaces: Flat Sections, Development. Intersection of Surfaces. Foundations. System of Bounded Planes: Foundations. Belonging and Incidence. Parallelism and *Perpendicularidad. Distances, Angles. *Abatimientos. Axonometric system: Foundations. Axonometric scales. Types of *axonometrias: *trimétrica, *dimétrica and isometric. System of Cavalier Perspective: Foundations. System of Conical Perspective: Foundation.

Block III. Normalisation.	Generalities on the drawing: - The drawing like language. - Types of drawings: technicians and artistic. - Technical drawings: architectural, topographical and industrial. - Industrial drawing: *Croquis, conjoint diagrams, *despieces and geometrical drawing. Normalisation of the drawing: - Advantages of the normalisation. - Difference between regulation, specification and norm. Basic normalisation: formats, writing, types of line, scales, etc. Representation normalised: - basic Principles of representation. Methods of projection - Seen. Seen particular: auxiliaries, interrupted, partial, local, turned, etc. - Courts, Sections and Breaks: Specifications, types of cut, sections (knocked down, displaced), etc. - *Rayado of courts: types of line, orientation, etc. - Conventionalisms: symmetrical pieces, repetitive elements, details, intersections, parts *contíguas, etc. *Acotación: - General principles of dimensioning. - Types of *acotación. Classification of the heights. - Principles of *acotación. - Elements of *acotación: Lines, extremes of lines, *inscriciones, etc. - Forms of *acotación: series, parallel, by coordinates, etc. - *Acotación of particular elements: radios, diameters, spheres, arches, symmetries, chamfers, etc. - Threads and threaded unions. Elements of a thread. Threaded elements. Classification of the threads. Representation of the threads. Threads normalised. - *Acotación Of threaded elements. - Designation of the threads. Drawings of group and *despiece: - Rules and agreements: reference to elements, material, numbering of planes, examples. - *Acotación Of groups. List of *despiece. Systems of tolerances and superficial finishings: - Types of tolerances: dimensional and geometrical. - Dimensional tolerances: linear and angular. - Tolerances ISO: qualities, positions, types of adjust, etc. - Systems of adjust. Examples. - Indication of superficial finishings. Representation of Elements Normalised. Diagrams.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	38	116	154
Problem solving	34	0	34
Seminars	4	0	4
Project based learning	0	27	27
Essay questions exam	2	0	2
Laboratory practice	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	
	Description
Lecturing	Active master Session. Each thematic unit will be presented by the professor, complemented with the comments of the students with base in the bibliography assigned or another pertinent.

Problem solving	They will pose exercises and/or problems that will resolve of individual way or *grupal.
Seminars	Realisation of activities of reinforcement to the learning by means of the resolution *tutelada of way *grupal of practical suppositions linked to the theoretical contents of the subject.
Project based learning	Realisation of activities that require the active participation and the collaboration between the students.

Personalized assistance

Methodologies	Description
Seminars	

Assessment

	Description	Qualification	Evaluated Competencess		
Essay questions exam	It will realise a final examination that will cover the whole of the contents of the subject, so many theorists like practical, and that they 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.	65	CG3 CG4	CE5	CT2 CT9
Laboratory practice	Along the triannual, in determinate sessions of resolution of problems and exercises 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.	35	CG4	CE5	CT2 CT6 CT9

Other comments on the Evaluation

In second announcement will realise to the student a theoretical proof-practical to evaluate his degree of acquisition of competitions, of analogous characteristics to the final examination, in which to surpass the *asignatura will be necessary to reach a minimum qualification of 5,0 points on 10 possible.

Ethical commitment: It is expected an adequate ethical behaviour of the student. In case of detecting unethical behaviour (copying, plagiarism, unauthorized use of electronic devices, etc.) shall be deemed that the student does not meet the requirements for passing the subject. In this case, the overall rating in the current academic year will be Fail (0.0).

Responsible professors of groups:

Group To: Javier *Corralo *Domonte.

Group *B: Carlos *Troncoso *Saracho.

Group C: Antonio Fernández Álvarez.

Group D: Carlos *Troncoso *Saracho.

Group G: Ernesto *Roa Farmyard.

Group *H: Esteban López *Figueroa.

Group I: Faustino *Patiño *Barbeito.

Group *J: Ernesto *Roa Farmyard.

Group *K: Manuel Adán Gómez.

Group L: Faustino *Patiño *Barbeito.

Sources of information

Basic Bibliography

Corbella Barros, David, **Trazados de Dibujo Geométrico 1**, Madrid 1970,

Ladero Lorente, Ricardo, **Teoría do Debuxo Técnico**, Vigo 2012,

Asociación Española de Normalización (AENOR), **Normas UNE de Dibujo Técnico**, Versión en vigor,

Félez, Jesús; Martínez, Mª Luisa, **DIBUJO INDUSTRIAL**, 3ª Edición, ISBN: 84-7738-331-6,

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

Complementary Bibliography

López Poza, Ramón y otros, **Sistemas de Representacion I**, ISBN 84-400-2331--6,

Izquierdo Asensi, Fernando, **Geometría Descriptiva**, 24ª Edición. ISBN 84-922109-5-8,

Auria, José M.; Ibáñez Carabantes, Pedro; Ubieto Artur, Pedro, **DIBUJO INDUSTRIAL. CONJUNTOS Y DESPIECES**, 2ª Edición, ISBN: 84-9732-390-4,

Guirado Fernández, Juan José, **INICIACIÓN Á EXPRESIÓN GRÁFICA NA ENXEÑERÍA**, ISBN: 84-95046-27-X,

Ramos Barbero, Basilio; García Maté, Esteban, **DIBUJO TÉCNICO**, 2ª Edición, ISBN: 84-8143-261-X,

Manuales de usuario y tutoriales del software DAO empleado en la asignatura,

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

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

Recommendations

Other comments

It is recommended for a suitable follow-up of the subject have of previous knowledges of drawing, to the level of the studies *cursados in the *Bachillerato of the Scientific Option-Technological.

In case of discrepancies between versions shall prevail spanish version of this guide.

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 ===
* Teaching methodologies maintained

* Teaching methodologies modified

* Non-attendance mechanisms for student attention (tutoring)

* Modifications (if applicable) of the contents

* Additional bibliography to facilitate self-learning

* Other modifications

=== ADAPTATION OF THE TESTS ===
* Tests already carried out
Test XX: [Previous Weight 00%] [Proposed Weight 00%]
...

* Pending tests that are maintained
Test XX: [Previous Weight 00%] [Proposed Weight 00%]
...

* Tests that are modified
[Previous test] => [New test]

* New tests

* Additional Information

IDENTIFYING DATA				
Physics: Physics I				
Subject	Physics: Physics I			
Code	V12G380V01102			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	Spanish Galician			
Department				
Coordinator	Lusquiños Rodríguez, Fernando			
Lecturers	Añel Cabanelas, Juan Antonio Blanco García, Jesús Boutinguiza Larosi, Mohamed Cabaleiro Álvarez, David Iglesias Prado, José Ignacio Legido Soto, José Luís Lusquiños Rodríguez, Fernando Méndez Morales, Trinidad Ribas Pérez, Fernando Agustín Sánchez Vázquez, Pablo Breogán Serra Rodríguez, Julia Asunción Soto Costas, Ramón Francisco Trillo Yáñez, María Cristina			
E-mail	flusqui@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	(*)Física do primeiro curso das Enxeñarías da rama Industrial			

Competencies	
Code	
CG3	CG3 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.
CE2	CE2 Understanding and mastering the basics of the general laws of mechanics, thermodynamics, waves and electromagnetic fields, as well as their application for solving engineering problems.
CT2	CT2 Problems resolution.
CT9	CT9 Apply knowledge.
CT10	CT10 Self learning and work.

Learning outcomes			
Learning outcomes	Competences		
(*)FB2a. Comprensión y dominio de los conceptos básicos sobre las leyes generales de la mecánica y campos y ondas y su aplicación para la resolución de problemas propios de la ingeniería.	CG3	CE2	
(*)CG3. Conocimiento en materias básicas y tecnológicas, que les capacite para el aprendizaje de nuevos métodos y teorías, y les dote de versatilidad para adaptarse a nuevas situaciones.		CE2	
(*)CS2. Aprendizaje y trabajo autónomos.	CG3	CE2	CT9 CT10
New	CG3	CE2	CT2 CT9 CT10

Contents	
Topic	
1.- UNITS, PHYSICAL AMOUNTS AND VECTORS	1.1.- The nature of Physics. 1.2.- Consistency and conversions of units. 1.3.- Uncertainty and significant figures. 1.4.- Estimates and orders of magnitude. 1.5.- Vectors and sum of vectors. 1.6.- Vector components. 1.7.- Unitary vectors. 1.8.- Vector products. 1.9.- Sliding Vectors

2.- CINEMATIC OF THE POINT	2.1.- Vectors of position, speed and acceleration. Half and instantaneous values 2.2.- Vectors angular speed and angular acceleration. Half and instantaneous values. 2.3.- Relation between linear cinematic magnitudes and angular 2.4.- Intrinsic components. 2.5.- Study of simple movements: *mov. Rectilinear, *mov. Circulate, shot *oblicuo 2.6.- Expressions of cinematic magnitudes in coordinates *cartesianas and polar
3.- LAWS OF THE MOVEMENT OF NEWTON	3.1.- Strength and interactions. 3.2.- First law of Newton. Systems of inertial and non inertial references 3.3.- Second law of Newton. 3.4.- Mass and weight. 3.5.- Third law of Newton. 3.6.- Quantity of movement. Mechanical impulse. Angular moment. 3.7.- Strengths of contact: active, of *ligadura.
4.- WORK AND KINETIC ENERGY	4.1.- Work realized by a Force. Power. 4.2.- Kinetic Energy. 4.3.- Conservative Forces 4.4.- Elastic potential energy. 4.5.- Potential energy in the gravitatory field. 4.6.- Mechanical energy. 4.7.- Strength and potential energy. 4.8.- Principle of conservation of the mechanical energy.
5.- KINEMATICS OF SYSTEM OF POINTS	5.1.- Points system. 5.2.- Rigid solid. 5.3.- Translation movement. 5.4.- Movement of rotation around a fixed axis. 5.5.- General movement. 5.6.- Instant center of rotation. 5.7.- Rolling motion. 5.8.- Relative movement.
6.- DYNAMICS OF THE SYSTEMS OF PARTICLES	6.1.- Systems of particles. Inner and exterior strengths. 6.2.- Center of masses of the system. Movement of the c.o.m. 6.3.- Equations of the movement of a system of particles. 6.4.- Linear moment. Theorem Of conservation. 6.5.- Angular moment of a system of particles. Theorem Of conservation. 6.6.- Work and power. 6.7.- Potential energy and kinetics of a system of particles. 6.8.- Theorem Of the energy of a system of particles. 6.9.- Crashes.
7.- DYNAMICS OF THE RIGID SOLID	7.1.- Rotation of a rigid solid around a fixed axis. 7.2.- Moments and products of inertia. 7.3.- Calculation of moments of inertia. 7.4.- Steiner's theorem. 7.5.- Moment of a force and pair of forces. 7.6.- Equations of the general movement of the rigid solid. 7.7.- Kinetic energy in the general movement of the rigid solid. 7.8.-Work in the general movement of the rigid solid. 7.9.- Angular moment of a rigid solid. Conservation theorem.
8.- STATIC	8.1.- Balance of rigid solids. 8.2.- Center of gravity. 8.3.- Stability. 8.4.- Degrees of freedom and ligatures
9.- PERIODIC MOVEMENT	9.1.- Description of the oscillation. 9.2.- Simple harmonic movement. 9.3.- Energy in the simple harmonic movement. 9.4.- Applications of simple harmonic movement. 9.5.- The simple pendulum. 9.6.- The physical pendulum. 9.7.- Damped oscillations. 9.8.- Forced oscillations and resonance.
10.- FLUID MECHANICS	10.1.- Density. 10.2.- Pressure in a fluid. 10.3.- Fundamental principles of Fluidostática. 10.4.- Continuity equation. 10.5.- Bernoulli equation.

11.- MECHANICAL WAVES	11.1.- Types of mechanical waves. 11.2.- Periodic waves. 11.3.- Mathematical description of a wave. 11.4.- Speed of a transverse wave. 11.5.- Energy of the wave movement. 11.6.- Wave interference, boundary conditions and superposition. 11.7.- Stationary waves on a string. 11.8.- Normal modes of a rope.
LABORATORY	1.- Theory of Measurements, Errors, Graphs and Adjustments. Examples 2.- Reaction Time. 3.- Determination of the density of a body. 4.- Relative Movement. 5.- Instantaneous speed. 6.- Study of the Simple Pendulum. 7.- Experiences with a helical spring. 8.- Damped and forced oscillations. 9.- Moments of inertia. Determination of the radius of rotation of a body. 10.- Stationary waves.
LABORATORY NO STRUCTURED	1. Sessions with activities no structured (open practice) that range the theoretical contents of the practices enumerated up. The groups of students have to resolve a practical problem proposed by the professor, selecting the theoretical frame and experimental tools to obtain the solution; for this, dispondrán of basic information and guide of the professor

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	24.5	45	69.5
Problem solving	8	20	28
Laboratory practical	18	18	36
Objective questions exam	1	0	1
Problem and/or exercise solving	3.5	0	3.5
Essay questions exam	3	0	3
Report of practices, practicum and external practices	0	9	9

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

Methodologies

	Description
Lecturing	Exhibition by part of the professor of the contents on the subject object of study, theoretical bases and/or guidelines of a work, exercise or project to develop by the student.
Problem solving	Activity in which formulate problem and/or exercises related with the asignatura. The student has to develop the felicitous or correct solutions by means of the ejercitación of routines, the application of formulas or algorithms, the application of procedures of transformation of the available information and the interpretation of the results. suele Use as I complement of the lesson magistral.
Laboratory practical	Activities of application of the knowledges to concrete situations and of acquisition of basic skills and procedimentales related with the subject object of study. They develop in special spaces with equipment especializado (laboratories, classrooms informáticas, etc).

Personalized assistance

Methodologies	**Description**
Lecturing	In office hours
Laboratory practical	in office hours
Problem solving	In office hours
Tests	**Description**
Objective questions exam	In office hours
Problem and/or exercise solving	In office hours
Essay questions exam	In office hours
Report of practices, practicum and external practices	In office hours

Assessment

	Description	Qualification	Evaluated Competencess		
Objective questions exam	Tests for evaluating the acquired competences that include closed questions with different answer alternatives (true / false, multiple choice, pairing of elements ...). Students select an answer from a limited number of possibilities.	10	CG3	CE2	
Problem and/or exercise solving	Test in which the student must solve a series of problems and / or exercises in a time / condition established by the teacher. In this way, the student must apply the knowledge they have acquired.	40	CG3	CE2	CT2
Essay questions exam	Competency assessment tests that include open-ended questions on a topic. Students must develop, relate, organize and present the knowledge they have on the subject in an extensive answer.	40	CG3	CE2	
Report of practices, practicum and external practices	Preparation of a document by the student that reflects the characteristics of the work carried out. Students must describe the tasks and procedures developed, show the results obtained or observations made, as well as the analysis and treatment of data.	10	CG3	CE2	CT9 CT10

Other comments on the Evaluation

The qualification of the continuous evaluation (which we will call EC) will have a weight of 40% of the final grade and will include both the contents of the laboratory practices (weight of 20%, which we will call ECL qualification) and of the classroom (weight of 20% , which we will call ECA qualification).

The ECA qualification will be obtained through theoretical-practical tests (they will be able to understand objective questions and / or development questions) on classroom content.

The ECL qualification will be obtained as the sum of the qualification of the Reports / memories of practices on laboratory contents.

Those students who can not follow the continuous assessment and who have been granted the rejection of the continuous assessment will have the possibility of taking a final written test to obtain a REC grade that will weigh 40% of the final grade and will include both the contents of the laboratory practices (weight of 20%, which we will call RECL rating) as classroom (weight of 20%, which we will call RECA rating).

The remaining 60% of the final grade will be obtained by completing a final exam that will consist of two parts: a theoretical part (which we will call T) that will weigh 20% of the final grade and another part of problem solving (which we will call P) that will have a weight of 40% of the final grade. The theoretical part will consist of a theoretical-practical test (objective questions and / or development questions). Those students who do not appear for the final exam will obtain a grade of not presented.

Both the final exams and those that are held on dates and / or times different from those officially set by the center, may have an exam format different from the one previously described, although the parts of the exam retain the same value in the final grade.

Final grade G of the subject for the continuous assessment modality:

G = ECL + ECA + T + P

Final grade G of the subject for the evaluation modality at the end of the semester and July (the RECL and RECA options only for students with waiver granted):

G = ECL (or RECL) + ECA (or RECA) + T + P.

To pass the subject, it is a necessary and sufficient condition to have obtained a final grade G greater than or equal to 5.

Ethical commitment: The student is expected to exhibit adequate ethical behavior. In the case of detecting unethical behavior (copying, plagiarism, unauthorized use of electronic devices, etc.), the student will be considered not to meet the necessary requirements to pass the subject. In this case, the overall grade in the current academic year will be suspended (0.0).

The use of any electronic device during the evaluation tests will not be allowed unless expressly authorized. The fact of introducing an electronic device not authorized in the exam room will be considered a reason for not passing the subject in this academic year and the overall rating will be suspended (0,0).

Sources of information

Basic Bibliography

1. Young H.D., Freedman R.A., **Física Universitaria, V1**, 13ª Ed., Pearson,

Complementary Bibliography

2. Tipler P., Mosca G., **Física para la ciencia y la tecnología, V1**, 5ª Ed., Reverté,
3. Serway R. A., **Física para ciencias e ingeniería, V1**, 7ª Ed., Thomson,
4. Juana Sardón, José María de, **Física general, V1**, 2ª Ed., Pearson Prentice-Hall,

5. Bronshtein, I. Semendiaev, K., **Handbook of Mathematics**, 5ª Ed., Springer Berlín,
6. Jou Mirabent, D., Pérez García, C., Llebot Rabagliati, J.E., **Física para ciencias de la vida**, 2ª Ed., McGraw Hill Interamericana de España S.L.,
7. Cussó Pérez, F., López Martínez, C., Villar Lázaro, R., **Fundamentos Físicos de los Procesos Biológicos**, 1ª Ed, ECU,
8. Cussó Pérez, F., López Martínez, C., Villar Lázaro, R., **Fundamentos Físicos de los Procesos Biológicos, Volumen II**, 1ª Ed, ECU,
9. Villar Lázaro R., López Martínez, C., Cussó Pérez, F., **Fundamentos Físicos de los Procesos Biológicos, Volumen III**, 1ª Ed, ECU,
10en. Villars, F., Benedek, G.b., **Physics with Illustrative Examples from Medicine and Biology**, 2ª Ed., AIP Press/Springer-Verlag,

Recommendations

Other comments

Recommendations:
1. Basic knowledge acquired in the subjects of Physics and Mathematics in previous courses.
2. Capacity for written and oral comprehension.
3. Abstraction capacity, basic calculation and synthesis of information.
4. Skills for group work and group communication.

In case of discrepancy between versions, the Spanish version of this guide will prevail.

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 ===
* Teaching methodologies maintained

* Teaching methodologies modified

All methodologies (master class, problem solving and laboratory practices): in the mixed modality, the teaching activity will be carried out combining face-to-face and non-face-to-face teaching using Remote Campus, also using the FAITIC teleteaching platform as reinforcement. In the non-classroom modality, the teaching activity will be carried out through the Remote Campus, also using the FAITIC teleteaching platform as reinforcement. All this without prejudice to being able to use complementary measures that guarantee the accessibility of the students to the educational contents.
Laboratory practices. In the mixed modality, the experimental activities using lab equipment and data collection by the students will suffer limitations and will be largely replaced by demonstrations in the laboratory carried out by teaching staff, which will be witnessed by the students present in the laboratory and accessible to the rest of the students by telematic means. The data processing activities do not require the use of equipment and can be carried out outside the laboratory (in a classroom, at home, etc.) and may be carried out by both the students present in the laboratory and by those who follow the class electronically. In the non-face-to-face modality, the classes will be maintained, but they will be developed entirely by telematic means. The activities of equipment management and data collection by the students will be totally replaced by demonstrations carried out by teaching staff and / or specific audiovisual material.

* Non-attendance mechanisms for student attention (tutoring)
The tutorials may be carried out either in person (as long as it is possible to guarantee sanitary guidelines) or telematically, either asynchronously (email, FAITIC forums, etc.) or by videoconference, in this case by appointment.

* Modifications (if applicable) of the contents

* Additional bibliography to facilitate self-learning

* Other modifications

=== ADAPTATION OF THE TESTS ===
* Tests already carried out
...

* Pending tests that are maintained
Final exam, part P 40%, maintains weight
Final exam, part T 20%, maintains weight

* Tests that are modified
ECA 20%, types of tests: comprises an exam of objective questions, exam of development questions => ECA 20%, types of tests: comprises an exam of objective questions, exam of development questions, problem solving and / or exercises .
ECL 20%, types of tests: comprises examination of development questions, practice report 10% => ECL, weight 20%, types of tests: comprises exam of development questions, problem solving and / or exercises, report of practices 10%.

* New tests

* Additional Information

IDENTIFYING DATA

Mathematics: Algebra and statistics

Subject	Mathematics: Algebra and statistics			
Code	V12G380V01103			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	9	Basic education	1st	1st
Teaching language	Spanish Galician English			
Department				
Coordinator	Luaces Pazos, Ricardo			
Lecturers	Bazarra García, Noelia Castejón Lafuente, Alberto Elias Fiestras Janeiro, Gloria Godoy Malvar, Eduardo Gómez Rúa, María Luaces Pazos, Ricardo Martín Méndez, Alberto Lucio Martínez Torres, Javier Matías Fernández, José María Meniño Cotón, Carlos Rodal Vila, Jaime Alberto Rodríguez Campos, María Celia Sestelo Pérez, Marta			
E-mail	rluaces@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	The aim of this course is to provide the student with the basic techniques in Algebra and Statistics that will be necessary in other courses of the degree. English Friendly subject: International students may request from the teachers: a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Competencies

Code	
CG3	CG3 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.
CE1	CE1 Ability to solve mathematical problems that may arise in engineering. Ability to apply knowledge about: linear algebra, geometry, differential geometry, differential and integral calculus, differential equations and partial differential equations, numerical methods, numerical algorithms, statistics and optimization.
CT2	CT2 Problems resolution.
CT5	CT5 Information Management.
CT6	CT6 Application of computer science in the field of study.
CT9	CT9 Apply knowledge.

Learning outcomes

Learning outcomes	Competences		
Acquire the basic knowledge on matrices, vector spaces and linear maps.	CG3	CE1	
Handle the operations of the matrix calculation and use it to solve problems to systems of linear equations.	CG3	CE1	CT2
Understand the basic concepts on eigenvalues and eigenvectors, vector spaces with scalar product and quadratic forms used in other courses and sove basic problems related to these subjects.	CG3	CE1	CT2 CT9
Perform basic exploratory analysis of databases.	CG3	CE1	CT5
Model situations under uncertainty by means of probability.	CG3	CE1	CT2
Know basic statistical models and their application to industry and perform inferences from data samples.	CG3	CE1	CT2 CT9
Use computer tools to solve problems of the contents of the course.	CG3		CT2 CT6

Contents

Topic	
Preliminaries	The field of complex numbers.
Matrices, determinants and systems of linear equations.	Definition and types of matrices. Matrices operations. Elementary transformations, row echelon forms, rank of a matrix. Inverse and determinant of a square matrix. Consistency of systems of linear equations and their solutions.
Vector spaces and linear maps.	Vector space. Subspaces. Linear independence, basis and dimension. Coordinates, change of basis. Basic notions on linear maps.
Eigenvalues and eigenvectors.	Definition of eigenvalue and eigenvector of a square matrix. Diagonalization of matrices by similarity transformation. Applications of eigenvalues and eigenvectors.
Vector spaces with scalar product and quadratic forms.	Vectorial spaces with scalar product. Associated norm and properties. Orthogonality. Gram-Schmidt orthonormalization process. Orthogonal diagonalization of a real and symmetric matrix. Quadratic forms.
Probability.	Concept and properties. Conditional probability and independence of events. Bayes Theorem.
Discrete random variables and continuous random variables.	Definition of random variable. Types of random variables. Distribution function. Discrete random variables. Continuous random variables. Characteristics of a random variable. Main distributions: Binomial, Geometric, Poisson, Hypergeometric, Uniform, Exponential, Normal. Central Limit Theorem.
Statistical inference.	General concepts. Sampling distributions. Point estimation. Confidence intervals. Tests of hypotheses.
Regression.	Scatterplot. Correlation. Linear regression: regression line. Inference about the parameters of the regression line.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	40	81	121
Problem solving	12	12	24
Laboratory practical	24	12	36
Autonomous problem solving	0	40	40
Essay questions exam	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

	Description
Lecturing	The lecturer will explain the contents of the course.
Problem solving	Problems and exercises will be solved during the classes. Students will also solve similar problems and exercises.
Laboratory practical	Computer tools will be used to solve problems related to the contents of the course.
Autonomous problem solving	Student will have to solve problems and exercises by their own.

Personalized assistance

Methodologies	Description
Laboratory practical	
Lecturing	
Problem solving	
Autonomous problem solving	

Assessment

	Description	Qualification	Evaluated Competencess		
Problem solving	Students will make several mid-term exams of Algebra and Statistics during the course.	40 por cento en Álxebra; 20 por cento en Estatística	CG3	CE1	CT2 CT5 CT6 CT9
Essay questions exam	At the end of the semestre there will a final exam of Algebra and a final exam of Statistics.	60 por cento en Álxebra; 80 por cento en Estatística	CG3	CE1	CT2 CT5 CT6 CT9

Other comments on the Evaluation

At the end of the first quarter, once the mid-term exams and the final exams have been done, the student will have a grade out of 10 points in Algebra (A) and a grade out of 10 points in Statistics (S). The final qualification of the subject will be calculated as follows:

- If both grades, A and S, are greater or equal to 3.5, then the final grade will be (A+S)/2.

- Any of the grades A or S is less than 3.5, then the final qualification will be the minimum of the quantities (A+S)/2 and 4.5.

The students who are exempted by the School from taking the mid-term exams will be evaluated through a final exam of Algebra (100% of the grade of this part) and a final exam of Statistics (100% of the grade of this part). The final grade will be calculated according to procedure described above.

A student will be assigned to NP ("absent") if he/she is absent in both final exams (i.e. Algebra and Statistics); otherwise he/she will be graded according the the procedure described above.

The assessment in the second call (June/July) will be done by means of a final exam of Algebra and a final exam of Statistics (100% of the grade of each part). The final grade will be calculated according to procedure described above.

If at the end of the first quarter a student obtains a grade equal to or greater than 5 out of 10 in any of the parts of the subject (Algebra or Statistics) then he/she will keep this grade in the second call (June/July) without retaking the corresponding exam.

Ethical commitment: Students are expected to commit themselves to an adequate and ethical behaviour. Students showing unethical behaviours (exam cheating, plagiarism, unauthorized use of electronic devices, etc.) will be rated with the minimum grade (0.0) in the current academic year.

As a general rule, the use of any electronic device for the assessment tests is not allowed unless explicitly authorized.

Sources of information

Basic Bibliography

Lay, David C., **Álgebra lineal y sus aplicaciones**, 4ª,
Nakos, George; Joyner, David, **Álgebra lineal con aplicaciones**, 1ª,
de la Villa, A., **Problemas de álgebra**, 4ª,
Cao, Ricardo et al., **Introducción a la Estadística y sus aplicaciones**, 1ª,
Devore, Jay L., **Probabilidad y estadística para ingeniería y ciencias.**, 8ª,
Devore, Jay L., **Probability and statistics for engineering and sciences**, 8ª,

Complementary Bibliography

Recommendations

Subjects that are recommended to be taken simultaneously

Mathematics: Calculus I/V12G380V01104

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 ===

ALGEBRA
=== ADAPTATION OF THE METHODOLOGIES ===
* Teaching methodologies maintained
The teaching will follow its planning, but it will be carried out using UVIGO`s technological platform.
* Non-attendance mechanisms for student attention (tutoring)
The tutorials will be carried out through the Remote Campus by appointment
=== ADAPTATION OF THE EVALUATION ===
The evaluation will follow its planning, but will be carried out using UVIGO`s technological platform.

STATISTICS:
=== ADAPTATION OF THE METHODOLOGIES ===
* Teaching methodologies maintained
Theoretical and practical teaching will be carried out telematically using the UVigo technological platfom.
* Non-attendance mechanisms for student attention (tutoring)
The tutorials will be carried out through the Remote Campus by appointment
=== ADAPTATION OF THE TESTS ===
* Tests already carried out
The weight of the mid-term exam will be maintained (20%).
* Pending tests that are maintained
The mid-term exam (20%) will be maintained if it had not been done in-person. This exam will be carried out using UVigo's technological platform.
First semester exam: The exam will be a multiple-choice test (80%).
Final exam: The exam will be a multiple-choice test (100%).

IDENTIFYING DATA				
Matemáticas: Cálculo I				
Subject	Matemáticas: Cálculo I			
Code	V12G380V01104			
Study programme	Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Basic education	1	1c
Teaching language	Castelán Galego			
Department	Matemática aplicada I Matemática aplicada II			
Coordinator	Martínez Martínez, Antonio			
Lecturers	Díaz de Bustamante, Jaime Martínez Martínez, Antonio Martínez Torres, Javier Meniño Cotón, Carlos Prieto Gómez, Cristina Magdalena Rodal Vila, Jaime Alberto Vidal Vázquez, Ricardo			
E-mail	antonmar@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	O obxectivo desta materia é que o estudante adquira o dominio das técnicas básicas de cálculo diferencial nunha e en varias variables e de cálculo integral nunha variable que son necesarias para outras materias que debe cursar na titulación.			

Competencias	
Code	
CG3	CG3 Coñecemento en materias básicas e tecnolóxicas que os capacite para a aprendizaxe de novos métodos e teorías, e os dote de versatilidade para adaptarse a novas situacións.
CG4	CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial na especialidade de Mecánica.
CE1	CE1 Capacidade para a resolución dos problemas matemáticos que poidan presentarse na enxeñaría. Aptitude para aplicar os coñecementos sobre: álxebra lineal; xeometría; xeometría diferencial; cálculo diferencial e integral; ecuacións diferenciais e en derivadas parciais; métodos numéricos; algorítmica numérica; estatística e optimización.
CT1	CT1 Análise e síntese.
CT2	CT2 Resolución de problemas.
CT6	CT6 Aplicación da informática no ámbito de estudo.
CT9	CT9 Aplicar coñecementos.
CT14	CT14 Creatividade.
CT16	CT16 Razoamento crítico.

Resultados de aprendizaxe			
Learning outcomes	Competences		
Comprensión dos coñecementos básicos de cálculo diferencial dunha e de varias variables.	CG3	CE1	CT1
Comprensión dos coñecementos básicos de cálculo integral de funcións dunha variable.	CG3	CE1	CT1
Manexo das técnicas de cálculo diferencial para a localización de extremos, a aproximación local de funcións e a resolución numérica de sistemas de ecuacións.	CG3 CG4	CE1	CT2 CT9 CT14 CT16
Manexo das técnicas de cálculo integral para o cálculo de áreas, volumes e superficies.	CG3 CG4	CE1	CT1 CT2 CT9 CT14 CT16
Utilización de ferramentas informáticas para resolver problemas de cálculo diferencial e de cálculo integral.	CG4	CE1	CT2 CT6 CT9 CT16

Contidos
Topic

Converxencia e continuidade	Introdución aos números reais. Valor absoluto. O espazo euclídeo R^n. Sucesións. Series. Límites e continuidade de funcións dunha e de varias variables.
Cálculo diferencial de funcións dunha e de varias variables	Cálculo diferencial de funcións dunha variable real. Cálculo diferencial de funcións de varias variables reais.
Cálculo integral de funcións dunha variable	A integral de Riemann. Cálculo de primitivas. Integrais impropias. Aplicacións da integral.

Planificación

	Class hours	Hours outside the classroom	Total hours
Resolución de problemas	20.5	30	50.5
Prácticas de laboratorio	12.5	5	17.5
Lección maxistral	32	39	71
Resolución de problemas e/ou exercicios	3	3	6
Exame de preguntas de desenvolvemento	2	3	5

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

Metodoloxía docente

	Description
Resolución de problemas	O profesor resolverá problemas e exercicios tipo e o alumno terá que resolver exercicios similares.
Prácticas de laboratorio	Empregaranse ferramentas informáticas para resolver exercicios e aplicar os coñecementos obtidos nas clases de teoría.
Lección maxistral	O profesor exporá nas clases teóricas os contidos dá a materia.

Atención personalizada

Methodologies	Description
Resolución de problemas	O profesor atenderá persoalmente as dúbidas e consultas do alumnado.
Prácticas de laboratorio	O profesor atenderá persoalmente as dúbidas e consultas do alumnado.

Avaliación

	Description	Qualification	Evaluated Competencess		
Resolución de problemas e/ou exercicios	Realizaranse probas escritas e/ou traballos.	40	CG3 CG4	CE1	CT1 CT2 CT6 CT9 CT14 CT16
Exame de preguntas de desenvolvemento	Farase un exame final sobre os contidos da totalidade da materia.	60	CG3 CG4	CE1	CT1 CT2 CT9

Other comments on the Evaluation

A avaliación continua levaráse a cabo sobre os criterios anteriormente expostos. Aqueles alumnos que non se acollan á avaliación continua serán avaliados cun exame final sobre os contidos da totalidade da materia, que suporá o 100% da nota.

A avaliación dos alumnos en segunda convocatoria consistirá nun exame sobre os contidos da totalidade da materia, que suporá o 100% da nota.

Compromiso ético:

"Espérase que o alumno presente un comportamento ético adecuado. En caso de detectar un comportamento non ético (copia, plaxio, utilización de aparellos electrónicos non autorizados, e outros) considerarase que o alumno non reúne os requisitos necesarios para superar a materia. Neste caso a cualificación global no presente curso académico será de suspenso (0.0)."

Bibliografía. Fontes de información

Basic Bibliography

Burgos, J., **Cálculo Infinitesimal de una variable**, 2ª, McGraw-Hill, 2007

Burgos, J., **Cálculo Infinitesimal de varias variables**, 2ª, McGraw-Hill, 2008
Galindo Soto, F. y otros, **Guía práctica de Cálculo Infinitesimal en una variable**, 1ª, Thomson, 2003
Galindo Soto, F. y otros, **Guía práctica de Cálculo Infinitesimal en varias variables**, 1ª, Thomson, 2005
Larson, R. y otros, **Cálculo 1**, 9ª, McGraw-Hill, 2010
Larson, R. y otros, **Cálculo 2**, 9ª, McGraw-Hill, 2010
Stewart, J., **Cálculo de una variable. Trascendentes tempranas**, 7ª, Thomson Learning, 2014

Complementary Bibliography

García, A. y otros, **Cálculo I**, 3ª, CLAGSA, 2007
García, A. y otros, **Cálculo II**, 2ª, CLAGSA, 2006
Rogawski, J., **Cálculo. Una variable**, 2ª, Reverte, 2012
Rogawski, J., **Cálculo. Varias variables**, 2ª, Reverte, 2012
Tomeo Perucha, V. y otros, **Cálculo en una variable**, 1ª, Garceta, 2011
Tomeo Perucha, V. y otros, **Cálculo en varias variables**, 1ª, Garceta, 2011

Recomendacións

Subjects that continue the syllabus

Matemáticas: Cálculo II e ecuacións diferenciais/V12G330V01204

Subjects that are recommended to be taken simultaneously

Matemáticas: Álxebra e estatística/V12G330V01103

Plan de Continxencias

Description

=== MEDIDAS EXCEPCIONAIS PLANIFICADAS ===
Ante a incerta e imprevisible evolución da alerta sanitaria provocada pola COVID- 19, a Universidade establece una planificación extraordinaria que se activará no momento en que as administracións e a propia institución o determinen atendendo a criterios de seguridade, saúde e responsabilidade, e garantindo a docencia nun escenario non presencial ou non totalmente presencial. Estas medidas xa planificadas garanten, no momento que sexa preceptivo, o desenvolvemento da docencia dun xeito mais áxil e eficaz ao ser coñecido de antemán (ou cunha ampla antelación) polo alumnado e o profesorado a través da ferramenta normalizada e institucionalizada das guías docentes DOCNET.

= === ADAPTACIÓN DE LAS METODOLOGÍAS Y EVALUACIÓN ===

Si la situación sanitaria lo requiere,

- La actividad docente se realizará a través de Campus Remoto, utilizando también la plataforma de teledocencia FAITIC como refuerzo, todo ello sin perjuicio de poder utilizar medidas complementarias que garanticen la accesibilidad de los estudiantes a los contenidos docentes.

- Las sesiones de tutorización se podrán llevar a cabo mediante medios telemáticos.

- La evaluación se realizará utilizando medios telemáticos. Durante el periodo de corrección de los exámenes por parte del profesorado, el estudiante podrá ser convocado telefónica o telemáticamente por su profesor para aclarar aspectos de sus respuestas. La ausencia de explicaciones convincentes tendrá repercusión en la calificación.

IDENTIFYING DATA				
Business: Introduction to business management				
Subject	Business: Introduction to business management			
Code	V12G380V01201			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	#EnglishFriendly Spanish Galician English			
Department				
Coordinator	Álvarez Llorente, Gema			
Lecturers	Álvarez Llorente, Gema Arevalo Tomé, Raquel Fernández Arias, María Jesús González-Portela Garrido, Alicia Trinidad Pérez Pereira, Santos Sinde Cantorna, Ana Isabel Urgal González, Begoña			
E-mail	galvarez@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	(*)Esta materia ten como obxectivo fundamental ofrecer ao alumno unha visión preliminar ou introdutoria, de carácter teórico-práctico, encol a natureza e o funcionamento das organizacións empresariais e a súa relación coa contorna na que operan, así como as actividades que levan a cabo. Para iso, entre outras cousas, definiremos o termo empresa dende un punto de vista multidimensional que abrangue a complexidade do seu funcionamento como sistema aberto. Posteriormente, analizaremos as relacións da empresa coa súa contorna, e entraremos no estudo das súas principais áreas funcionais que contribúen ao correcto desenvolvemento da súa actividade.			

Competencies	
Code	
CG9	CG9 Ability to organize and plan within the sphere of a company, and other institutions and organizations.
CE6	CE6 Adequate knowledge of the concept of enterprise and institutional and legal framework of enterprises. Organization and Business Management.
CT1	CT1 Analysis and synthesis
CT2	CT2 Problems resolution.
CT7	CT7 Ability to organize and plan.
CT18	CT18 Working in an international context.

Learning outcomes			
Learning outcomes		Competences	
Know the role of the company in the field of economic activity.		CE6	CT18
Understand the basic aspects that characterize the different types of companies.		CE6	CT1 CT18
Know the legal framework of the different types of companies.		CE6	CT1
Know the most relevant aspects of the organization and management in the company.	CG9	CE6	CT1 CT18
Acquire skills on the processes that affect business management.	CG9	CE6	CT2 CT7 CT18

Contents	
Topic	
1. THE COMPANY	1.1 The nature of the firm 1.2 The role of the company in the socio-economic system. 1.3 The company as a system. 1.4 The environment of the company. 1.5 Company objectives and goals. 1.6 Types of companies.

2. FINANCIAL MANAGEMENT (PART I). ECONOMIC AND FINANCIAL STRUCTURE OF THE COMPANY	2.1 Economic and financial structure of the company. 2.2 Working Capital 2.3 Operating cycle and Cash Conversion Cycle 2.4 Working Capital requirement
3. FINANCIAL MANAGEMENT (PART II). UNDERSTANDING THE RESULTS OF THE COMPANY	3.1 The results of the company. 3.2 The profitability of the company. 3.3 The competitive strategy.
4. FINANCIAL MANAGEMENT (PART III). INVESTMENT DECISIONS.	4.1 Definition of Investment. 4.2 Types of investments. 4.3. Investment Appraisal Techniques
5: The FINANCIAL SYSTEM (PART IV). FINANCE	5.1 Concept of source of finance. 5.2 Types of sources of finance. 5.3 Analyses of the solvency and liquidity of the company.
6. OPERATION MANAGEMENT (PART I). GENERAL FEATURES	6.1 Production system. 6.2 Efficiency. 6.3 Productivity 6.4 Research, development and innovation (R&D&I).
7: The SYSTEM OF PRODUCTION (PART II). The COSTS OF PRODUCTION	7.1 Concept of cost. 7.2 Classification of the costs. 7.3 The cost of production. 7.4 The margins of the company. 7.5 Threshold of profitability. 7.6 Capacity of production and location. 7.7 Management of inventories.
8. MARKETING MANAGEMENT	8.1 What is marketing? 8.2 Basic concepts. 8.3 Marketing tools: Marketing mix.
9. MANAGEMENT AND ORGANIZATION	9.1 Components of the organization and management system. 9.2 The management system. 9.3 The human system. 9.4 The cultural system. 9.5 The political system.
PRACTICES OF THE MATTER *The programming of the practical can experience changes in function of the evolution of the course.	Practice 1: Application of concepts of the subject 1. Practice 2: Application of concepts of the subject 1. Practice 3: Application of concepts of the subject 2. Practice 4: Application of concepts of the subject 2. Practice 5: Application of concepts of the subject 2. Practice 6: Application of concepts of the subject 3. Practice 7: Application of concepts of the subject 4. Practice 8: Application of concepts of the subject 5. Practice 9: Application of concepts of the subject 6. Practice 10: Application of concepts of the subject 7. Practice 11: Application of concepts of the subject 8. Practice 12: Application of concepts of the subject 9.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	32.5	45.5	78
Laboratory practical	18	45	63
Objective questions exam	3	6	9
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Lecturing	Explanation of the main contents of the course.
Laboratory practical	Application to specific problems of the knowledge acquired in theoretical classes.

Personalized assistance	
Tests	**Description**
Objective questions exam	The students will have occasion of acudir to tutorías in the dispatch of the professor in the time that the professors will establish to such effect to principle of course and that will publish in the platform of teledocencia Faitic. These tutorías are destinadas to resolve doubts and orientar to the students on the development of the contents abordados in the theoretical kinds, the practical kinds and the works that can them encomendar. In this apartado also includes the aclaración to the students of any question on the proofs realized along the course.

Assessment					
	Description	Qualification	Evaluated Competencess		
Laboratory practical	In accordance with the planning docente of the academic course, the student will have to develop a number determined of practices that include diverse exercises of application of the knowledges purchased in the kinds of theory to concrete situations and allow to develop diverse basic skills (capacity for the resolution of problems, initiative, work in team, etc.). These practices do not take part in the calculation of the qualification of the subject, but exige to the student obtain an exert minimum in the same for the superación of the subject.	0	CG9	CE6	CT1 CT2 CT7 CT18
Objective questions exam	Will realize , and minimum, two test type test along the course, in which will evaluate the knowledges, the destrezas and the competitions purchased by the students so much in the classrooms of theory and of practices.	100	CG9	CE6	CT1 CT2

Other comments on the Evaluation

1. Ethical commitment:

The student is expected to exhibit adequate ethical behavior. In the case of detecting unethical behavior (copy, plagiarism, use of unauthorized electronic devices, for example) it will be considered that the student does not meet the necessary requirements to pass the subject. In that case, the overall grade in the current academic year will be suspended

(0.0).

2. Continuous evaluation system

Following the guidelines of the degree and the agreements of the academic commission will offer students / s who study this subject a continuous assessment system.

The continuous evaluation will consist of two test type tests that will be carried out throughout the course. Each one of the test type tests will deal with the contents seen until the moment of its realization, both in theory and practical classes. Therefore, the first test will not release material for the performance of the second test. Due to this, each of these tests will have a different weight in the calculation of the grade obtained in the subject. The first 30% and the second 70%.

These tests are not recoverable, that is, if a student can not perform them on the stipulated date, the teacher does not have to repeat them, unless justified and duly accredited by the student.

The student has the right to know the grade obtained in each test within a reasonable time after its completion and discuss the result with the teacher.

It will be understood that the student has passed the continuous evaluation when all the following requirements are met:

1. 75% of the practices of the subject have been correctly developed.

2. At least a grade of 5 out of 10 (passed) has been obtained in the last test type test (which will cover all the contents seen in the subject).

3. The weighted average of the marks obtained in the test type tests is a minimum of 5 out of 10 (passed), this being the grade obtained in the subject.

In order for the student to be able to take the evaluation tests indicated in this point, the student must meet the first requirement expressed in the previous paragraph.

If the weighted average of the marks obtained in the test type tests is greater than or equal to 5 but the grade obtained in the last test type test is less than 5, the student will not have passed the subject and his grade will be the one obtained in the second test.

It will be understood that a student has opted for continuous assessment when, fulfilling the necessary requirements

regarding the completion of practices, participates in the second test type test.

The qualification obtained in the test and practice tests will only be valid for the academic year in which they take place.

3. Students who do not opt for continuous assessment

Students who do not opt for continuous assessment will be offered an evaluation procedure that allows them to reach the highest grade. This procedure will consist of a final exam (whose date is set by the Management of the Center), in which all the contents developed in the subject will be evaluated, both in the theory classes and in the practical classes. This final exam will consist of two parts: a theory test in a test-type format, which will represent 30% of the final grade, and another part of practice, which will be the remaining 70%, and which will consist of a series of exercises to be developed. It is an essential condition to pass the subject to obtain a minimum score of 5 out of 10 (Approved) in the test type test. In case of not passing the test type test, the final grade of the student will be the one obtained in said test evaluated on 3.

Only those students who do not perform any of the assessment tests included in this teaching guide will be considered "not submitted". Specifically, for those students who take the first test type test but then do not take the second test type test and do not show up for the final exam, their grade in the subject will be the grade obtained in the first test type test evaluated on 3.

4. About the July call

The call for recovery (July) will consist of a final exam that will be 100% of the final grade and in which all the contents developed in the subject will be evaluated, both in the theory classes and in the practical classes. This exam will consist of two parts: a theory test in test format, which will mean 30% of the final grade, and another practice, which will be the remaining 70%, and which will consist of a series of exercises to be developed. It is an essential condition to pass the subject to obtain a minimum score of 5 out of 10 (Approved) in the test type test. In case of not passing the test type test, the final grade of the student will be the one obtained in said test evaluated on 3.

5. Prohibition of the use of electronic devices

The use of any electronic device during the evaluation tests will not be allowed, unless expressly authorized. The fact of introducing an electronic device not authorized in the examination room, will be considered a reason for not passing the subject in this academic year and the overall rating will be suspended (0,0).

Sources of information

Basic Bibliography

Barroso Castro, C. (Coord.), **Economía de la empresa**, 2012,

Moyano Fuentes, J.; Bruque Cámara, S.; Maqueira Marín, J.M.; Fidalgo Bautista, F.A.; Martínez Jurado, **Administración de empresas: un enfoque teórico-práctico**, 2011,

García Márquez, F., **Dirección y Gestión Empresarial**, 2013,

Iborra Juan, M.; Dasi Coscollar, A.; Dolz Dolz, C.; Ferrer Ortega, C., **Fundamentos de dirección de empresas. Conceptos y habilidades directivas**, 2014,

Complementary Bibliography

Recommendations

Subjects that continue the syllabus

Basics of operations management/V12G320V01605

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes extraordinary planning that will be activated at the time that the administrations and the institution itself determine it based on criteria of safety, health and responsibility , and guaranteeing teaching in a non-classroom or partially classroom setting. These measures already planned guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance by students and teachers through the standardized and institutionalized tool of the teaching

guides.

=== ADAPTATION OF THE METHODOLOGIES ===

The teaching activity will be carried out through Campus Remoto, also using the FAITIC e-learning platform. Other supplementary platforms may be used to guarantee the accessibility to teaching contents.

Tutoring sessions may be carried out online: either asynchronously (e-mail, FAITIC, forums, etc.) or by videoconference, in this case by appointment.

=== ADAPTATION OF THE TESTS ===

In order to adapt the teaching guide to the exceptional planning, the assesment proceesses would consist of the following evaluable activities:

1. CONTINUOUS ASSESMENT

a) Several tests that will be carried out throughout the course on the different parts of the syllabus, depending on the topics anlyzed in both theory and practical classes, as well as the material provided to prepare them. Taking these tests, the student may achieve a maximum score of 6 points.

b) The student will also obtain points for each of the practices successfully passed throughout the course, achieving a maximum score of 1.5 points.

c) A final test with a maximum score of 2.5 points, covering issues related to the entire syllabus, will be carried out on the official date for the final exam of the course set by the governing bodies of the Escola de Inxenería Industrial.

None of these activities will be recoverable, that is, if a student cannot perform them on the stipulated date, the professor is not obliged to repeat them, except for justified cause duly accredited by the student.

The score obtained in the tests and in the practices will only be valid for the academic course in which they are carried out.

2. NON-CONTINUOUS ASSESSMENT

A test with a maximum score of 10 points and covering issues related to the entire syllabus of the subject will be carried out on the official date set by the governing bodies of the Escola de Inxenería Industrial.

Students may renounce continuous assessment and opt for non-continuous assessment by written request to the professor, within the period established for this purpose and this period will be announced in advance.

3. NON ORDINARY EXAM IN JUYLY

Non ordinary exam in July will consist of a test with a maximum score of 10 points and that will cover issues related to the entire syllabus of the course. That test will be carried out on the official date set by the governing bodies of the Escola de Inxenería Industrial.

All the evaluable activities will be carried out through the telematic resources provided by the University of Vigo for this purpose, and following the measures set by the governing bodies of the University of Vigo.

Only those students who do not take any of the assessment tests included in this teaching guide will be considered as not submitted.

IDENTIFYING DATA				
Physics: Physics II				
Subject	Physics: Physics II			
Code	V12G380V01202			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	Fernández Fernández, José Luís			
Lecturers	Añel Cabanelas, Juan Antonio Blanco García, Jesús Fernández Fernández, José Luís Legido Soto, José Luís López Vázquez, José Carlos Lusquiños Rodríguez, Fernando Paredes Galán, Ángel Pérez Davila, Sara Quintero Martínez, Félix Ribas Pérez, Fernando Agustín Sánchez Vázquez, Pablo Breogán Soto Costas, Ramón Francisco			
E-mail	jlfdez@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	This undergraduate course is the second quarter of introductory physics. The focus is on electricity, magnetism and thermodynamics			

Competencies	
Code	
CG3	CG3 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.
CE2	CE2 Understanding and mastering the basics of the general laws of mechanics, thermodynamics, waves and electromagnetic fields, as well as their application for solving engineering problems.
CT2	CT2 Problems resolution.
CT9	CT9 Apply knowledge.
CT10	CT10 Self learning and work.

Learning outcomes			
Learning outcomes	Competences		
Understanding the basic concepts of electromagnetism and thermodynamics.	CG3	CE2	
Knowing the basic instruments for the measurement of physical quantities.		CE2	
Knowing the basic techniques for experimental data evaluation.	CG3	CE2	CT9 CT10
Ability to develop practical solutions to basic technical problems in engineering, within the framework of electromagnetism and thermodynamics.	CG3	CE2	CT2 CT9 CT10

Contents	
Topic	
1.- ELECTRIC CHARGE AND ELECTRIC FIELD	1.1.- Electric Charge. 1.2.- Conductors, Insulators and Induced Charges. 1.3.- Coulomb□s Law. 1.4.- Electric Field and Electric Forces. 1.5.- Electric Field Calculations. 1.6.- Electric Field Lines. 1.7.- Electric Dipoles.
2.- GAUSS'S LAW	2.1.- Charge and Electric Flux. 2.2.- Calculating Electric Flux. 2.3.- Gauss's Law. 2.4.- Applications of Gauss's Law. 2.5.- Conductors in Electrostatic Equilibrium.

3.- ELECTRIC POTENTIAL	3.1.- Electric Potential Energy. 3.2.- Electric Potential. 3.3.- Calculating Electric Potential. 3.4.- Equipotential Surfaces. 3.5.- Potential Gradient.
4.- CAPACITANCE AND DIELECTRICS	4.1.- Capacitors and Capacitance. 4.2.- Capacitors in Series and Parallel. 4.3.- Energy Storage in Capacitors and Electric-Field Energy. 4.4.- Dielectrics, Molecular Model of Induced Charge, and Polarization Vector. 4.5.- Gauss's Law in Dielectrics. 4.6.- Dielectric Constant and Permittivity.
5.- CURRENT, RESISTANCE, AND ELECTROMOTIVE FORCE	5.1.- Electric Current. 5.2.- Current and Current Density. 5.3.- Ohm□s Law and Resistance. 5.4.- Electromotive Force and Circuits. 5.5.- Energy and Power in Electrical Circuits. 5.6.- Basic Theory of Electrical Conduction.
6.- MAGNETIC FIELD	6.1.- Magnetic Field. 6.2.- Motion of Charged Particles in a Magnetic Field. 6.3.- Magnetic Force on a Current-Carrying Conductor. 6.4.- Force and Torque on a Current Loop. 6.5.- Biot-Savart□s Law. 6.6.- Magnetic Field Lines and Magnetic Flux. 6.7.- Ampère□s Law.
7.- MAGNETIC FIELD IN MATTER	7.1.- Magnetic Substances and Magnetization Vector. 7.2.- Ampère□s Law in Magnetic Media. 7.3.- Magnetic Susceptibility and Permeability. 7.4.- Paramagnetism and Diamagnetism. 7.5.- Ferromagnetism.
8.- ELECTROMAGNETIC INDUCTION	8.1.- Induction Experiments. 8.2.- Faraday-Lenz's Law. 8.3.- Induced Electric Fields. 8.4.- Eddy Currents. 8.5.- Mutual Inductance. 8.6.- Self-Inductance and Inductors. 8.7.- Magnetic-Field Energy.
9.- THERMODYNAMIC SYSTEMS	9.1.- Classical Thermodynamics. 9.2.- Thermodynamic Systems and Classification. 9.3.- State Variables and State of a System. 9.4.- Equations of State. 9.5.- Thermodynamic Equilibrium. 9.6.- Change of State, Transformation or Process. 9.7.- Quasi-static Processes. 9.8.- State and Process Functions.
10.- TEMPERATURE AND HEAT	10.1.- Thermal Equilibrium, The Zeroth Law of Thermodynamics, and Temperature. 10.2.- Thermometers and Temperature Scales. 10.3.- Ideal Gas Thermometers and the Kelvin Scale. 10.4.- Heat. 10.5.- Calorimetry and Heat Capacities.
11.- THE FIRST LAW OF THERMODYNAMICS	11.1.- Work. 11.2.- Work Done During Volume Changes. 11.3.- Internal Energy. 11.4.- The First Law of Thermodynamics. 11.5.- Internal Energy of an Ideal Gas. 11.6.- Molar Heat Capacities of an Ideal Gas. 11.7.- Adiabatic, Isothermal, Isobaric and Isochoric Processes for an Ideal Gas. 11.8.- Enthalpy.

12.- THE SECOND LAW OF THERMODYNAMICS	12.1.- Directions of Thermodynamic Processes. 12.2.- Heat Engines, Refrigerators, and Heat Pumps. 12.3.- The Second Law of Thermodynamics: Clausius and Kelvin-Planck Statements. 12.4.- Carnot Engine. 12.5.- Carnot Theorems. 12.6.- Thermodynamic Temperature. 12.7.- Entropy. 12.8.- Increase of Entropy Principle. 12.9.- Entropy Change of an Ideal Gas.
LABORATORY	1.- How to Use a Multimeter. Ohm□s Law. Direct Current. Circuit with Resistors. 2.- Linear and Non-Linear Conductors. 3.- Charge and Discharge of a Capacitor. 4.- Analysis of a Parallel Plate Capacitor with Dielectrics. 5.- Utilization of an Oscilloscope to Analyze Charge and Discharge Processes. 6.- Study of the Magnetic Field. Helmholtz Coils. Magnetic Moment. Hall Effect. 7.- Calorimetry. Water Equivalent of Calorimeter. Latent Heat of Fusion. 8.- Thermodynamics of the Ideal Gas. Heat Capacity Ratio. Adiabatic Work.
LABORATORY: UNSTRUCTURED ACTIVITY (OPEN LAB) SESSIONS	Unstructured activity (open lab) sessions that cover the topics of the above cited regular laboratory sessions. A practical problem will be assigned to each team. Then, under the teacher□s supervision, each team must analyse the problem, select a theoretical model and experimental means to obtain a solution.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	24.5	45	69.5
Problem solving	8	20	28
Laboratory practical	18	18	36
Objective questions exam	1	0	1
Problem and/or exercise solving	3.5	0	3.5
Essay questions exam	3	0	3
Report of practices, practicum and external practices	0	9	9

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

Methodologies

	Description
Lecturing	Lectures are given by the teacher on the contents of the subject, theoretical bases and / or guidelines of a work, exercise or project to be performed by the students.
Problem solving	Activity in which problems and / or exercises related to the subject are formulated. The student must develop the appropriate or correct solutions through the repetition of routines, the application of formulas or algorithms, the application of procedures for transforming the available information and the interpretation of the results. It is usually used as a complement to the lecture sessions.
Laboratory practical	Activities for applying the knowledge to particular situations and for the acquisition of basic and procedural skills related to the subject. They are developed in dedicated rooms with specialized equipment (laboratories, computer rooms, etc.).

Personalized assistance

Methodologies	**Description**
Lecturing	In office hours.
Laboratory practical	In office hours.
Problem solving	In office hours.
Tests	**Description**
Objective questions exam	In office hours.
Problem and/or exercise solving	In office hours.
Essay questions exam	In office hours.
Report of practices, practicum and external practices	In office hours.

Assessment

	Description	Qualification	Evaluated Competencess		
Objective questions exam	Tests for the assessment of acquired knowledge that include closed questions with different response options (true/false, multiple choice, matching of elements...). Students select a response among a limited number of choices.	10	CG3	CE2	
Problem and/or exercise solving	Test in which the student must solve a series of problems and / or exercises in a time / conditions set by the teacher. In this way, the student should apply the acquired knowledge.	40	CG3	CE2	CT2
Essay questions exam	Tests that include open questions on a topic. Students should develop, relate, organize and present knowledge on the subject in an argued response.	40	CG3	CE2	
Report of practices, practicum and external practices	Preparation of a report by the students which reflects the characteristics of the work that has been carried out. Students must describe the developed tasks and procedures, show the results or observations made, as well as the data analysis and processing.	10	CG3	CE2	CT9 CT10

Other comments on the Evaluation

Continuous assessment (denoted EC) will have a weight of 40% in the final mark, and will include the lab mark (20%, denoted ECL) and the class mark (20%, denoted ECA).

The mark ECA will be evaluated by means of tests on the topics covered in the lectures. These tests will comprise objective questions and/or essay questions.

The mark ECL will be evaluated by the lab reports and tests on the topics covered in the laboratory sessions.

Those students unable to attend the continuous assessment and who have been granted the waiver of the continuous assessment have the possibility of taking a final test to obtain a REC mark with a weight of 40% of the final mark. This test will include the contents of the lab sessions (weight of 20%, denoted RECL) and the topics covered in the lectures (weight of 20%, denoted RECA).

The remaining 60% of the final mark will be obtained by taking a final exam. This will consist of two parts: a theoretical part (denoted T) with a weight of 20% of the final mark, and another part on problem solving (denoted P) with a weight of 40% of the final mark. The theoretical part will consist of a test comprising objective questions and/or essay questions. Those students not attending the final exam will obtain a mark of non-presented.

Both the "fin de carrera" exam and any other ones held on dates and/or times different from those officially set by the School of Industrial Engineering (E.E.I.), could have an exam format different from the one previously described, although each part of the exam (EC or REC, T and P) will hold its weight in the final mark.

Final mark G for the continuous assessment modality:

G = ECL + ECA + T + P.

Final mark G for the assessment at the end of the course and July (RECL and RECA only for those students who have been granted the waiver of the continuous assessment):

G = ECL (or RECL) + ECA (or RECA) + T + P.

To pass the course, a student must obtain a final mark G equal to or higher than 5.

Ethical commitment: Every student is expected to follow an appropriate ethical behaviour. In the case that unethical conduct is detected (copy, plagiarism, utilisation of unauthorised electronic devices, or others), it will be considered that the student does not fulfil the necessary requirements to pass the subject. In this case, the final mark in the present academic year will be "suspenso" (0.0).

Students should not possess or use any electronic device during the tests and exams, unless specifically authorised to do so. The mere fact that a student carries an unauthorised electronic device into the examination room will result in failing the subject in the present academic year and the final mark will be "suspenso" (0.0).

Sources of information

Basic Bibliography

1. Young H. D., Freedman R. A., **Física Universitaria, V1 y V2**, 13ª ed., Pearson,

1en. Young H. D., Freedman R. A, **University physics: with modern physics**, 14th ed., Pearson,

Complementary Bibliography

2. Tipler P., Mosca G., **Física para la ciencia y la tecnología, V1 y V2**, 5ª ed., Reverté,

2en. Tipler P., Mosca G, **Physics for Scientists and Engineers, V1 and V2**, 6th ed., W. H. Freeman and Company,

3. Serway R. A., Jewett J. W, **Física para ciencias e ingeniería, V1 y V2**, 9ª ed., Cengage Learning,

3en. Serway R. A., Jewett J. W, **Physics for Scientists and Engineers**, 9th ed., Brooks/Cole,

4. Juana Sardón, J. M., **Física general, V1 y V2**, 2ª ed., Pearson Prentice-Hall,

5. Bronshtein, I., Semendiaev, K., **Manual de matemáticas para ingenieros y estudiantes**, 4ªed., MIR 1982; MIR-Rubiños 1993,

5en. Bronshtein, I., Semendiaev, K., **Handbook of Mathematics**, 5th Ed., Springer Berlin,

6. Jou Mirabent, D., Pérez García, C., Llebot Rabagliati, J. E., **Física para ciencias de la vida**, 2ª ed., McGraw-Hill Interamericana de España S.L.,

7. Cussó Pérez, F., López Martínez, C., Villar Lázaro, R., **Fundamentos Físicos de los Procesos Biológicos**, 1ª ed., ECU,

8. Cussó Pérez, F., López Martínez, C., Villar Lázaro, R., **Fundamentos Físicos de los Procesos Biológicos, Volumen II**, 1ª ed., ECU,

9. Villar Lázaro, R, López Martínez, C., Cussó Pérez, F., **Fundamentos Físicos de los Procesos Biológicos, Volumen III**, 1ª ed., ECU,

10en. Villars, F., Benedek, G. B., **Physics with Illustrative Examples from Medicine and Biology**, 2nd ed., AIP Press/Springer-Verlag,

Recommendations

Other comments

Basic recommendations:
1. Basic knowledge acquired in the subjects of Physics and Mathematics in previous courses.
2. Oral and written comprehension.
3. Capacity for abstraction, basic calculus, and synthesis of information.
4. Skills for group work and communication.

In the event of discrepancy, the Spanish version of this syllabus prevails.

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 ===
* Teaching methodologies maintained
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* Teaching methodologies modified
All the methodologies (lecturing, problem solving and laboratory practical): in the blended learning regime face-to-face classroom activities will be combined with online lecturing through the virtual campus (Campus Remoto), using FAITIC platform as an additional support. In the distance learning regime, online lecturing will take place through virtual campus (Campus Remoto), using FAITIC platform as an additional support as well. To guarantee the access of the students to the materials and resources of the course other methodologies and media could be implemented if needed.
Laboratory practicals: in blended learning, the operation of experimental devices by the students and the associated data acquisition activities could suffer major restrictions. These activities will be mostly replaced by demonstrations developed by the lecturer in the lab and watched by the students attending the lab session. These demonstrations could be followed online by the rest of the students. Data processing and analysis are greatly independent of the operation of experimental devices and can be developed outside the laboratory (in another classroom, at home, etc..), so such activities could be realized by students attending the lab as well as by students participating online. In the distance learning regime, the laboratory practicals will be developed entirely online and the operation of experimental devices and data acquisition activities to be done by the students will be completely replaced by demonstrations developed by the lecturer and/or specific audiovisual materials.

* Non-attendance mechanisms for student attention (tutoring)
Office hours and tutoring could be developed both face-to-face (provided that safety can be guaranteed) or online, by using asynchronous media (email, forum, etc.) or by videoconference (by making an appointment).

* Modifications (if applicable) of the contents
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* Additional bibliography to facilitate self-learning
--

* Other modifications
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=== ADAPTATION OF THE TESTS ===
* Tests already carried out
Test XX: [Previous Weight 00%] [Proposed Weight 00%]
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* Pending tests that are maintained
Test XX: [Previous Weight 00%] [Proposed Weight 00%]
Final exam, part P 40%, the weight of the exam is maintained.
Final exam, part T 20%, the weight of the exam is maintained.

* Tests that are modified
[Previous test] => [New test]
ECA 20%, types of tests may include: objective questions exam, essay questions exam => ECA 20%, types of tests may include: objective questions exam, essay questions exam, problem and/or exercise solving.
ECL 20%, types of tests may include: essay questions exam, practices report 10% => ECL 20%, types of tests may include: essay questions exam, problem and/or exercise solving, practices report 10%.

* New tests
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* Additional Information
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IDENTIFYING DATA				
Computer science: Computing for engineering				
Subject	Computer science: Computing for engineering			
Code	V12G380V01203			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	Spanish Galician English			
Department				
Coordinator	Rajoy González, José Antonio Rodríguez Damian, María			
Lecturers	Ibáñez Paz, Regina Pérez Cota, Manuel Rajoy González, José Antonio Rodríguez Damian, Amparo Rodríguez Damian, María Rodríguez Diéguez, Amador Sáez López, Juan Vázquez Núñez, Fernando Antonio			
E-mail	mrdamian@uvigo.es jarajoy@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	They treat the following contents: Methods and basic algorithms of programming Programming of computers by means of a language of high level Architecture of computers Operating systems basic Concepts of databases			

Competencies	
Code	
CG3	CG3 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.
CG4	CG4 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.
CE3	CE3 Basic knowledge on the use and programming of computers, operating systems, databases and software applications in engineering.
CT1	CT1 Analysis and synthesis
CT2	CT2 Problems resolution.
CT5	CT5 Information Management.
CT6	CT6 Application of computer science in the field of study.
CT7	CT7 Ability to organize and plan.
CT17	CT17 Working as a team.

Learning outcomes	Competences		
Computer and operating system skills.	CG3	CE3	CT5 CT6 CT7
Basic understanding of how computers work	CG3	CE3	CT1 CT5
Skills regarding the use of computer tools for engineering	CG3	CE3	CT5 CT6 CT7 CT17
Database fundamentals	CG3	CE3	CT1 CT5 CT6 CT7

Capability to implement simple algorythims using a programming language	CG3 CG4	CE3	CT2 CT7 CT17
Structured and modular programming fundamentals	CG3 CG4	CE3	CT2 CT5 CT17

Contents	
Topic	
Basic computer architecture	Basic components Peripheral devices Communications
Basic programming concepts and techniques applied to engineering	Data structures Control structures Structured programming Information treatment Graphical user interfaces
Operating systems	Basic principles Types
Practical exercises that support and secure the theoretical concepts	Practical exercises that will allow the students to verify the concepts learned in class and see that using them they can solve problems
Computer tools applied to engineering	Types and examples

Planning			
	Class hours	Hours outside the classroom	Total hours
Introductory activities	1	1	2
Laboratory practical	22	30	52
Case studies	12	14	26
Lecturing	8	12	20
Objective questions exam	4	7	11
Laboratory practice	6	8	14
Essay questions exam	10	15	25
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Introductory activities	Activities related to estashing contact, gathering information from the students, organizing groups, as well as presenting the course.
Laboratory practical	Activities related to applying the knowledge obtained to specific situations and acquiring basic and procedimental skills related with the subject being studied. Developed in specialized spaces with specialized equipment (labs, computer rooms, etc).
Case studies	Analyze a fact, problem or real event with the purpose of knowing it, interpreting it, resolving it, generating hypothesis, contrasting data, thinking about it, gaining new knowledge, diagnosing it and training alternative solutions
Lecturing	Exhibition of the contents that make up the subject being studied on behalf of the profesor, theoretical principles and/or instructions regarding an assignment, exercise or project to be developed by the student.

Personalized assistance	
Methodologies	**Description**
Laboratory practical	Questions will be resolved during the laboratory sessions and the student will be shown the different options to solve a problem. Teachers' tutoring in the stipulated time and format.

Assessment					
	Description	Qualification	Evaluated Competencess		
Objective questions exam	Tests for evaluating aquired competencies that include cuestions from which the student must choose a response from a set of alternatives (true/false, multiple choice,...)	15	CG3	CE3	CT5

Laboratory practice	Tests for evaluating aquired competencies that include activities, problems or practical excercises to be solved.	70	CG3 CG4	CE3	CT1 CT2 CT5 CT6 CT7 CT17
Essay questions exam	Tests for evaluating aquired competencies that include cuestions regarding a subject. The students must develop, relate, organize and present their knowledge regarding the subject.	15	CG3 CG4	CE3	CT1 CT2 CT5 CT6 CT7

Other comments on the Evaluation

Ethical commitment:

Students are expected to behave ethically. If unethical behaviour is detected (copying,plagiarism, use of unauthorized electronic

devices and others), then it will beconsidered that the student does not meet the minimum requirements to pass thecourse. In this case, the final grade for the current academic year will befailed (0.0).

In additionto the ethical commitment, the following is underlined:
In the first place, a person registered in the course is by default subject to the continuous assessment system; if the student does not want to be in this system, the he/she must expressly renounce to it within the established deadlines.

CONTINUOUSASSESSMENT OPERATION

In the present course, the continuous assessment will collect all the evidence oflearning from the person enrolled and will be grouped into three assessments.The first two will take place preferably in the laboratories: Test 1 and Test2. The third evaluation may be written: Test 3. If the student does notrenounce to the continuous evaluation system, tests that are not attended will be considered as qualified as zero (0.0). A minimum score of 30% out of 10 (3.0points) must be obtained in the last two evaluations: Test 2 and Test 3, inorder to be eligible to have the final average calculated. If this requirementis not met and the final average is equal to or greater than 5, the final gradewill be 4:

Test 1 * 0.3 + (Test 2>=3) * 0. 4 + (Test 3>=3) * 0. 3 >=5

A studentis considered passed if he/she obtains a five or more in compliance with allthe requirements.

First call (May/June):

The following must be met to pass the subject under continuous assessment:
Test 1 * 0.3 + (Test 2>=3) * 0. 4 + (Test 3>=3) * 0.3 >= 5

Once thefirst evaluation: Test 1, has been carried out, the person enrolled may requestto abandon the continuous evaluation system (within the period and by the meansestablished by the teaching staff). In this way, the person enrolled will beable to follow the non-continuous assessment system.

Second call (June/July):

If a person does not reach the passing level in the first exam (May/June) but has passed the minimum mark in the second exam: Test 2, in the second call (June/July) he/she can choose to keep the grades of the first two tests, and take a 4-points exam, or take a 100% exam in the subject (10 points). If the person takes the 4-points test, he/she will be asked for a minimum score of 30% out of 10 (3. 0 points) in order to calculate the final grade. If this requirement is not met and the final average is equal to or greater than 5, the final grade will be 4.

NON-CONTINUOUS EVALUATION OPERATION

An exam that allows students to obtain 100% of the grade. The exam may be divided into sections, minimuns can be required.

First call (May/June):

Registered students who have expressly renounced to the continuous assessment system may take the May/June exam (on the date and at the time proposed by the School) and take an exam that allows them to obtain 100% of the grade. This exam is not open to those who have failed the continuous assessment.

Second call (June/July):

An exam will be proposed to evaluate 100% of the subject, for those who have not achieved the minimum mark in the first call.
The version of the guide was made in Spanish. For any doubt or contradiction, the Spanish guide will be mandatory.

Sources of information

Basic Bibliography

Eric Matthes, **Python Crash Course, 2nd Edition: A Hands-On, Project-Based Introduction to Programming**, 2019
Sébastien Chazallet, **Python 3. Los fundamentos del lenguaje - 2ª edición**, 2016
Dictino Chaos García, **Introducción a la informática básica (GRADO)**, 2017

Complementary Bibliography

Tanenbaum, Andrew S.,, **Sistemas Operativos Modernos**, Pearson Education, 2009
Silberschatz, Abraham ,Korth Henry, Sudarshan, S.,, **Fundamentos de bases de datos**, McGraw-Hill,, 2014

Recommendations

Contingency plan

Description

=== EXCEPTIONAL MEASURES SCHEDULED ===

=== ADAPTATION OF THE METHODOLOGIES ===

* Educational methodologies mantained
The methodologies: lecturing, laboratory practical and the study of cases, will continue on being valid but supported by services, such as: Remote Campus, Moovi, or other that the University of Vigo has available at that moment.

* Educational methodologies modified: it won´t be necessary to modify any educational methodology because all they can be adapted.

* Mechanism to individual tutoring
Each professor involved will put in knowledge of the students the different ways to establish a channel of communication, these methods can be e-mail, theacher virtual office, forums, etc. This information will be always available to students.

* Additional bibliography to facilitate non-attendance education
The bibliography will be made available to students from the beginning of the course. The students can choose the resources that best suit their needs: manuals, solved exercises, videos, etc. Does not apply additional bibliography.

=== ADAPTATION OF THE EVALUATION ===

The evaluation criteria are maintained, adapting the performance of the tests, if necessary and by indication in the rectoral resolution.

* additional Information
The content of the subject will remain the same, and the different means that the University of Vigo makes available to us will be searched for, those that facilitate the transmission of knowledge and evaluation.

IDENTIFYING DATA				
Matemáticas: Cálculo II e ecuacións diferenciais				
Subject	Matemáticas: Cálculo II e ecuacións diferenciais			
Code	V12G380V01204			
Study programme	Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Basic education	1	2c
Teaching language	Castelán Galego Inglés			
Department	Matemática aplicada I Matemática aplicada II			
Coordinator	Cachafeiro López, María Alicia			
Lecturers	Bazarra García, Noelia Cachafeiro López, María Alicia Calvo Ruibal, Natividad Castejón Lafuente, Alberto Elias Durany Castrillo, José Fernández García, José Ramón Godoy Malvar, Eduardo Martínez Brey, Eduardo Meniño Cotón, Carlos Rodal Vila, Jaime Alberto			
E-mail	acachafe@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	U obxectivo que se persegue con esta asignatura é que o alumno coñeza as técnicas básicas de o cálculo integral en varias variables, cálculo vectorial, ecuaciones diferenciales ordinarias e as súas aplicacións.			

Competencias	
Code	
CG3	CG3 Coñecemento en materias básicas e tecnolóxicas que os capacite para a aprendizaxe de novos métodos e teorías, e os dote de versatilidade para adaptarse a novas situacións.
CG4	CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial na especialidade de Mecánica.
CE1	CE1 Capacidade para a resolución dos problemas matemáticos que poidan presentarse na enxeñaría. Aptitude para aplicar os coñecementos sobre: álxebra lineal; xeometría; xeometría diferencial; cálculo diferencial e integral; ecuacións diferenciais e en derivadas parciais; métodos numéricos; algorítmica numérica; estatística e optimización.
CT1	CT1 Análise e síntese.
CT2	CT2 Resolución de problemas.
CT3	CT3 Comunicación oral e escrita de coñecementos.
CT6	CT6 Aplicación da informática no ámbito de estudo.
CT9	CT9 Aplicar coñecementos.
CT15	CT15 Obxectivación, identificación e organización.
CT16	CT16 Razoamento crítico.

Resultados de aprendizaxe			
Learning outcomes	Competences		
Comprensión de os conceptos básicos de o cálculo integral en varias variables.	CG3	CE1	CT1
Coñecemento de as principais técnicas de integración de funcións de varias variables.	CG3 CG4	CE1	CT1 CT2 CT9
Coñecemento de os principais resultados de o cálculo vectorial e aplicacións.	CG3 CG4	CE1	CT1 CT2 CT9
Adquisición de os coñecementos básicos para a resolución de ecuaciones e sistemas diferenciales lineais.	CG3 CG4	CE1	CT1 CT2 CT9
Comprensión de a importancia de o cálculo integral, cálculo vectorial e de as ecuaciones diferenciales para o estudo de o mundo físico.		CE1	CT9 CT16

Aplicación de os coñecementos de cálculo integral, cálculo vectorial e de ecuaciones diferenciales.	CE1	CT2 CT6 CT9 CT16
Adquisición de a capacidade necesaria para utilizar estes coñecementos en a resolución manual e informática de cuestións, exercicios e problemas.	CE1	CT1 CT2 CT3 CT6 CT9 CT15 CT16

Contidos	
Topic	
Integración en varias variables.	Integral dobre sobre rectángulos. Principio de Cavalieri. Redución a integrales iteradas. Integral dobre sobre rexións elementais. Propiedades. Teorema de Fubini. Teorema de o cambio de variable. Caso particular de coordenadas polares. Integral triplo sobre unha caixa e sobre rexións elementais. Teorema de Fubini. Teorema de o cambio de variable. Casos particulares: coordenadas cilíndricas e esféricas. Aplicacións geómetricas e físicas de a integral múltiple: cálculo de volumes, centros de masa e momentos de inercia.
Cálculo vectorial	Curvas no plano e no espazo. Lonxitude de arco. Cambio de parámetro. Integral curvilínea ou de traxectoria con respecto á lonxitude de arco de campos escalares. Integral curvilínea ou circulación de campos vectoriales. Propiedades. Teorema fundamental das integrais de liña. Teorema de Green no plano. Superficies regulares. Plano tangente. Vector normal. Área dunha superficie. Integral de superficie de campos escalares. Fluxo ou integral de superficie de campos vectoriales. Operadores diverxencia e rotacional. Caracterización de campos conservativos. Teorema de Stokes. Teorema de Gauss.
Ecuacións diferenciais	Ecuacións diferenciais ordinarias. Concepto de solución. Teoremas de existencia e unicidade para problemas de condición inicial. Métodos de resolución de ecuacións diferenciais ordinarias de primeira orde: en variables separables, reducibles a variables separables, homoxéneas, lineais e reducibles a lineais. Ecuacións diferenciais exactas. Factores integrantes. Ecuación diferencial dunha familia uniparamétrica de curvas planas. Traxectorias ortogonales. Ecuacións diferenciais lineais de orde 2 e de orde superior. Problemas de condición inicial. Conxuntos fundamentais. Método de variación de parámetros. Método de coeficientes indeterminados. Redución de orde. Ecuación de Euler. Sistemas de ecuacións diferenciais lineais.
Métodos numéricos para problemas de valor inicial	Introdución aos métodos numéricos. Métodos de Euler e Euler mellorado. Método de Runge-Kutta de orde 4.

Planificación			
	Class hours	Hours outside the classroom	Total hours
Lección maxistral	32	60	92
Resolución de problemas	22	24	46
Prácticas de laboratorio	9	0	9
Exame de preguntas de desenvolvemento	3	0	3
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente	
	Description
Lección maxistral	O profesor exporá nas clases teóricas os contidos da materia. Os alumnos terán textos básicos de referencia para o seguimento da materia.
Resolución de problemas	O profesor resolverá problemas e exercicios e o alumno terá que resolver exercicios similares para adquirir as capacidades necesarias.
Prácticas de laboratorio	O profesor resolverá problemas e exercicios de forma manual e/ou mediante o uso de ferramentas informáticas e o alumno terá que resolver exercicios similares para adquirir as capacidades necesarias.

Atención personalizada

Methodologies	Description
Resolución de problemas	O profesor atenderá persoalmente as dúbidas e consultas dos alumnos, en especial nas clases de problemas e laboratorio e en *tutorías.
Prácticas de laboratorio	O profesor atenderá persoalmente as dúbidas e consultas dos alumnos, en especial nas clases de problemas e laboratorio e en *tutorías.

Avaliación

	Description	Qualification	Evaluated Competencess		
Resolución de problemas	Realizarase probas escritas e/ou traballos.	40	CG3 CG4	CE1	CT1 CT2 CT3 CT6 CT9 CT15 CT16
Exame de preguntas de desenvolvemento	Realizarase una proba final sobre os contidos de toda a materia.	60	CG3 CG4	CE1	CT1 CT2 CT3 CT9 CT15 CT16

Other comments on the Evaluation

A avaliación continua levarase a cabo sobre os criterios anteriormente expostos. A cualificación final do alumno será a mellor nota entre a obtida mediante avaliación continua e a obtida na proba final.
Aqueles alumnos que non se acollan á avaliación continua serán evaluados cun exame final sobre os contidos de toda a materia que supoñerá o 100% da nota.
A avaliación dos alumnos en segunda convocatoria consistirá nun exame sobre os contidos da asignatura que supoñerá o 100% da nota.
Compromiso ético:
Espérase que o alumno presente un comportamento ético adecuado. En caso de detectar un comportamento non ético (por exemplo, copia, plagio, utilización de aparellos electrónicos non autorizados) considerarase que o alumno non reúne os requisitos necesarios para superar a materia. Neste caso a cualificación global da asignatura no presente curso académico será de suspenso con cualificación numérica de 0.

Bibliografía. Fontes de información

Basic Bibliography

Larson, R., Edwards, B.H., **Cálculo 2 de varias variables**, 9ª edición, McGraw-Hill, 2010

Marsden, E., Tromba, A.J., **Cálculo Vectorial**, 6ª edición, Pearson, 2018

Rogawski, J., **Cálculo: varias variables**, 2ª edición, Reverté, 2012

Thomas, G.B. Jr., **Cálculo: varias variables**, 12ª edición, Addison-Wesley-Pearson Education, 2010

García, A., López, A., Rodríguez, G., Romero, S., de la Villa, A., **Cálculo II. Teoría y problemas de funciones de varias variables**, 2ª edición, CLAGSA, 2002

Nagle, K., Saff, E.B., Snider, A.D., **Ecuaciones diferenciales y problemas con valores en la frontera**, 4ª edición, Pearson Educación, 2005

Zill, D.G., **Ecuaciones Diferenciales con aplicaciones de modelado**, 9ª edición, Cengage Learning, 2009

García, A., García, F., López, A., Rodríguez, G., de la Villa, A., **Ecuaciones Diferenciales Ordinarias**, CLAGSA, 2006

Kincaid, D., Cheney, W., **Métodos numéricos y computación**, 6ª edición, Cengage Learning, 2011

Complementary Bibliography

Recomendacións

Subjects that it is recommended to have taken before

Matemáticas: Álxebra e estatística/V12G320V01103
Matemáticas: Cálculo I/V12G320V01104

Other comments

En caso de discrepancias, prevalecerá a versión en castelán desta guía.

Plan de Continxencias

Description

=== MEDIDAS EXCEPCIONAIS PLANIFICADAS ===
Ante a incerta e imprevisible evolución da alerta sanitaria provocada pola COVID- 19, a Universidade establece una planificación extraordinaria que se activará no momento en que as administracións e a propia institución o determinen atendendo a criterios de seguridade, saúde e responsabilidade, e garantindo a docencia nun escenario non presencial ou non totalmente presencial. Estas medidas xa planificadas garanten, no momento que sexa preceptivo, o desenvolvemento da docencia dun xeito mais áxil e eficaz ao ser coñecido de antemán (ou cunha ampla antelación) polo alumnado e o profesorado a través da ferramenta normalizada e institucionalizada das guías docentes DOCNET.

=== ADAPTACIÓN DAS METODOLOXÍAS ===

Si la situación sanitaria lo requiere, la actividad docente se realizará a través de Campus Remoto, utilizando también la plataforma de teledocencia FAITIC como refuerzo, todo ello sin perjuicio de poder utilizar medidas complementarias que garanticen la accesibilidad de los estudiantes a los contenidos docentes.

Las sesiones de tutorización se podrán llevar a cabo mediante medios telemáticos, bien de forma asíncrona (correo electrónico, foros de FAITIC, etc.) o bien mediante videoconferencia, en este caso mediante cita previa.

Información adicional.
Si los exámenes fuesen no presenciales, durante el período de corrección de los mismos, el estudiante podrá ser contactado por su profesor para aclarar aspectos de sus respuestas (auditoría) con el fin de evitar copias o plagios. La ausencia de explicaciones convincentes tendrá repercusión en la calificación del alumno.

IDENTIFYING DATA				
Chemistry: Chemistry				
Subject	Chemistry: Chemistry			
Code	V12G380V01205			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	Spanish Galician English			
Department				
Coordinator	Cruz Freire, José Manuel			
Lecturers	Alonso Gómez, José Lorenzo Álvarez Álvarez, María Salomé Bolaño García, Sandra Bravo Bernárdez, Jorge Cruz Freire, José Manuel Díez Sarabia, Aida María Iglesias Antelo, María Beatriz Meijide Fernández, Jéssica Moldes Moreira, Diego Nóvoa Rodríguez, Ramón Otero Martínez, Nicolás Ramos Berdullas, Nicolás Rey Losada, Francisco Jesús Salgado Seara, José Manuel Vecino Bello, Xanel			
E-mail	jmcruz@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	This is a basic subject, common for all levels of the industrial fields studies. At the end of the course the students will have a basic knowledge about the principles of general chemistry, organic chemistry and inorganic chemistry, and its application to Industry. This knowledge will be further applied and expanded in other areas of the studies.			

Competencies	
Code	
CG3	CG3 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.
CE4	CE4 Ability to understand and apply the basic knowledge of general chemistry, organic chemistry and inorganic chemistry, and their applications in engineering.
CT2	CT2 Problems resolution.
CT10	CT10 Self learning and work.
CT17	CT17 Working as a team.

Learning outcomes	Competences		
Learning outcomes			
Knowing the chemical bases of industrial technologies. Specifically, the student will gain basic knowledge of general, organic and inorganic chemistry and their applications in engineering. This will allow the student to apply the basic concepts and fundamental laws of chemistry. Due to theoretical-practical training, the student will be able to effectively carry out lab experiments and to solve basic chemistry exercises.	CG3	CE4	CT2 CT10 CT17

Contents
Topic

1. Atomic theory and chemical bonding	1.1 Atomic theory: Particles of the atom: Electron, proton et neutron. Characteristics of the atom: Atomic number and Atomic mass. Isotopes. Stability of the nucleus: Radioactivity (natural and artificial). Evolution of the atomic theory. 1.2. Chemical bonding: Definition. Intramolecular bonding: Covalent bonding and ionic bonding. Polyatomic molecules: hybridization and delocalization of electrons. Intermolecular bonding: Types of intermolecular forces.
2. States of aggregation: Solids, gases, pure liquids and solutions	2.1. Solid state: Introduction. Classification of solids: amorphous solids, molecular crystals and liquid crystals, Covalent crystals and ionic crystals. 2.2. Gaseous state: Characteristics of the gas phase. Ideal gases: Equation of state. Real gases: Equation of state. Properties of gases. 2.3. Liquid state: Characteristics of the liquid phase: physical properties (density, surface tension, viscosity). Changes of state. Phase diagram. Solutions: colligative properties
4.Chemical equilibrium: in gas phase, acid-base-base, redox, solubility	(4.1. Chemical equilibrium: Concept of Equilibrium. Equilibrium Constant. Types of equilibrium. The Le Chatelier Principe. 4.2. Acid-base Equilibrium: Definition of acid and base. Autoionization of water. Ionic Product. Concept of pH and pOH. Strength of acids and bases: Polyprotic acids. Amphoters. pH calculation. Acid-base titration. Buffer solutions. 4.3. Redox equilibrium: Concept of oxidation, reduction, oxidising agent, reducing agent. Balance of redox reactions in acid and alkaline media. Redox titration. Electrochemical cells: basic concepts and redox potential. Thermodynamics of electrochemical reactions: Gibbs Energy and cell Potential. Nernst Equation. Faraday□s Laws. 4.4 Solubility equilibrium: Soluble salts: Hydrolysis. Sparingly soluble salts: solubility and solubility product. Factors affecting solubility. Fractional Precipitation. Complex Salts: Definition, properties, dissociation and importance.
5. Chemical kinetics	5.1. Basic Concepts: Reaction Rate. Reaction Order. Kinetic Constant. Rate Equation. 5.2. Determination of the Rate Equation: Initial rate method. Integrated Rate Laws. 5.3. Factors affecting the Reaction Rate.
6. Basic principles of Organic Chemistry	6.1. Fundamentals of Organic formulation and functional groups: 6.1.1. ºStructure of the organic compounds: Alkanes, alkenes and alkynes. Aromatic Hydrocarbons. 6.1.2. Alcohols and phenols. 6.1.3. Ethers. 6.1.4. Aldehydes and ketones. 6.1.5. Esters. 6.1.6. Carboxylic acids and derivatives. 6.1.7. Amines and nitro-compounds.
7. Basic principles of Inorganic Chemistry.	7.1. Metallurgy and the Chemistry of Metals: Abundance of metals. Nature of the metallic bond, properties. Theory of the Conduction Band: conducting materials, semiconductors and superconductors. Metallurgical processes: iron and steel. 7.2. Non-metallic elements and their compounds: General properties. Hydrogen. Carbon. Nitrogen and phosphorous. Oxygen and sulphur. Halogens.
8. Applied Electrochemistry	8.1. Applications of the Nernst equation: Determination of pH, Equilibrium constant, solubility product. 8.2. Electrochemical cells: types of cells. Concentration Cells. Electric Conductivity in electrolytes. Electrolysis Cells. 8.3. Industrial Processes of electrolysis: electrodeposition (electroplating), electrometallurgy, electrolysis chlorine□caustic soda. Fuel cells.

9. Corrosion and treatment of Surfaces	9.1. Basic principles of Corrosion: the corrosión cell. 9.2. Corrosion of metals. 9.3. Corrosion rate. 9.4. Types of Corrosion. 9.5. Protection against Corrosion: Design considerations for Corrosion protection. Cathodic protection: sacrificial anodes and impressed current. Organic Coatings. Metallic coatings.
10. Electrochemical sensors	10.1. Fundamentals. 10.2. Typology and function. 10.3. Conductivity Sensors. 10.4. Potentiometric Sensors. 10.5. Ion Selective electrodes. pH sensors. 10.6. Sensors for gases in solution. 10.7. Enzyme-based sensors: Biosensors. 10.8. Amperometric and voltammetric sensors. 10.9. Applications of sensors: medicine, industry, environment.
11. Petroleum and derivatives. Petrochemistry	11.1. Physicochemical characteristics of petroleum (oil). 11.2. Physicochemical characteristics of natural gas. 11.3. Conditioning and uses of natural gas. 11.4. Drilling and crude oil extraction. 11.5. Fractioning of oil. 11.6. Cracking, alkylation, reforming and isomerisation of hydrocarbons. 11.7. Treatment of sulphurous compounds and refining units.
12. Carbon: Carbochemistry	(12.1. Formation of carbon. 12.2. Types of carbons and their constitution. 12.3. Technological uses of carbon. 12.4. Pyrogenation of carbon. 12.5. Hyidrogenation of carbon. 12.6. Direct liquefaction of carbon. Gasification.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	32	45	77
Problem solving	10	12	22
Laboratory practical	5.4	7.6	13
Autonomous problem solving	0	25.5	25.5
Objective questions exam	1	0	1
Problem and/or exercise solving	3	0	3
Report of practices, practicum and external practices	1	7.5	8.5

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

Methodologies

	Description
Lecturing	Presentation by the faculty member of the theoretical content of the subject using audiovisual media.
Problem solving	Activity in which problems and/or exercises related to the subject will be formulated. Students should develop appropriate solutions by applying formulas or algorithms to manage the available information and interpret the results.
Laboratory practical	Activities of application of the theoretical background to specific situations, aimed to the acquisition of basic skills related to the subject. Will be developed in the laboratories or computer rooms of the center in which subject is given. Those rooms will be equipped with the necessary specialized equipment.
Autonomous problem solving	Activity in which the teacher formulates problems and/or exercises related to the subject, and the student must develop the analysis and resolution in an autonomous way.

Personalized assistance

Methodologies	Description
Lecturing	Any doubt related with the contents given in the mater sessions will be clarified.
Problem solving	Any doubt related with the problems resolved in the seminars of problems will be answered.
Laboratory practical	Any doubt related with the laboratory practices will be answered.

Assessment

	Description	Qualification	Evaluated Competencess		
Autonomous problem solving	Students must solve independently, and periodically submit problems or exercises formulated by the faculty member. The results and the procedure followed in the execution will be evaluated. According to current legislation, the final grade will be numeric and between 0 and 10.	10	CG3	CE4	CT2 CT10
Objective questions exam	The purpose of these tests, which will be carried out in the date of the official announcement of examinations, is to assess the level of theoretical knowledge acquired by students in classroom sessions. Written tests are multiple choices, multiple responses, in which students can achieve a numerical score between 0 and 10, according to current legislation.	40	CG3	CE4	CT10
Problem and/or exercise solving	The evaluation of the knowledge gained by students in seminars will be through a written exam, in the official announcement of examinations, in which the student must solve 4 or 5 problems related to the subject under study. The exam will be graded according to the current legislation, with a numerical final grade between 0 and 10.	40	CG3	CE4	CT2 CT10
Report of practices, practicum and external practices	After each laboratory session, the student should answer an oral question or prepare a detailed report including aspects such as objective and theoretical foundations, procedure followed, materials used, results and interpretation. The aspects considered in the evaluation are the content of the report, the understanding of the work done, the ability of summarising, quality of presentation, and the personal contribution. The final score, between 0 and 10, will be the average of the marks obtained in the various reports made and/or writing or oral test that could be done for each practice.	10		CE4	CT17

Other comments on the Evaluation

The final exam, consisting of two different parts, a test-type quiz for theory content and a set of exercises, will be considered for the final score weighting only when they were rated greater than or equal to 4. Although the average score could be equal or greater than 5, if the qualification of any of the parts of the final exam be lower than 4, the final score will be the lowest mark obtained in the final exam (which is the one that does not permit to calculate the average mark). The attendance to any lab session or any seminar test means that the student is being evaluated and therefore a qualification of "not presented" is no longer possible.

The marks of continuous evaluation (seminars test and lab experiments) and the marks of final exam higher than 5 (test quiz or exercises) obtained in the first call will be kept for the second call.

Those students that obtain officially the renunciation to the continuous evaluation will be evaluated by the final exam, to be held in the official date for the two calls. The final qualification will consist of a 50% of exercises and a 50% of theory (test-type) exam. A rate equal to or greater than 4 in both parts is necessary in order to pass the exam.

Ethical commitment:

The student is expected to present an adequate ethical behavior. If an unethical behavior is detected (copying, plagiarism, unauthorized use of electronic devices, and others) it is considered that the student does not meet the requirements for passing the subject. In this case, the final grade in the current academic year will be FAIL (0.0 points).

The use of electronic devices during the assessment tests will be not permitted. Introducing an unauthorized electronic device into the examination room, will be considered as a FAIL (0.0 points) in the current academic year.

Sources of information

Basic Bibliography

Chang, R., **Química**, Ed. McGraw Hill,

Petrucci, R. H., Herring, F.G., Madura, J.D., Bissonnette, C., **Química General**, Ed. Prentice-Hall,

Reboiras, M.D, **Química. La ciencia básica**, Ed. Thomsom,

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Reboiras, M.D., **Problemas resueltos de de Química. La ciencia básica**, Ed. Thomson,

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Atkins, P. y Jones, L, **Principios de Química. Los caminos del descubrimiento**, Ed. Interamericana,

Herranz Agustin, C, **Química para la ingeniería**, Ediciones UPC,

McMurry, J.E. y Fay, R.C, **Química General**, Ed. Pearson,
Herranz Santos, M.J. y Pérez Pérez M.L., **Nomenclatura de Química Orgánica**, Ed. Síntesis,
Quiñoá, E. y Riguera, R., **Nomenclatura y representación de los compuestos orgánicos : una guía de estudio y autoevaluación**, Ed. McGraw Hill,
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Llorens Molina, J.A., **Ejercicios para la introducción a la Química Orgánica**, Ed Tébar,
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Brown, L.S., Holme, T.A., **Chemistry for engineering students**, Brooks/Cole Cengage Learning, 3rd ed.,

Recommendations

Subjects that it is recommended to have taken before

Physics: Physics 1/V12G350V01102
Mathematics: Algebra and statistics/V12G350V01103
Mathematics: Calculus 1/V12G350V01104

Other comments

It is recommended that students have taken and passed the subject of ""Chemistry"" in second baccalaureate or, alternatively, passed a specific test of access to the Degree.

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

=== EXCEPTIONAL MEASURES SCHEDULED ===
Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes extraordinary planning that will be activated at the time that the administrations and the institution itself determine it based on safety, health and responsibility criteria and guaranteeing teaching in a non-classroom or partially classroom setting. 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 by the students and teachers through the standardized tool and institutionalized teaching guides or syllabus.

=== ADAPTATION OF THE METHODOLOGIES ===

All the teaching methodologies explained in the syllabus are maintained, but the lectures will be performed by means of the Remote Campus of the University of Vigo.
If the lab practices could not be developed in person, the theoretical content will be explained by Remote Campus. Moreover, some videos recorded by the teachers will be provided, so that the student could see the procedure that should be done. Then, the students will be provided with experimental data, so that they can complete the corresponding lab report.
Office hours could be carried out in different modalities: in person, by email or through the virtual offices at the Remote Campus of the University of Vigo.

=== ADAPTATION OF THE EVALUATION ===

Modification of the evaluation tests:
Autonomous problem solving: the student must periodically deliver the problems or exercises formulated by the teacher; this topic increase their weight in the grade from 10% to 30%.
Problem solving and / or exercises: The final problem exam, to be held on the official dates set by the EEI, reduces its weight in the final grade, from 40% to 20%. The test will be graded with a final numerical grade between 0 and 10.
Multiple choice test: The final theory exam will be carried out on the official dates set by the EEI; it will be a multiple-choice test; it reduces its weight in the final grade from 40% to 20%. The test will be graded with a final numerical grade between 0 and 10.
Lab Practices report: The qualification of the laboratory practices maintains a weight of 10% in the final grade.
Autonomous resolution of theory questionnaires: These new continuous assessment tests are added; the student must carry out theory multiple-choice tests, which will have a weight of 20% in the final grade.

Considering that some students could be unable to do some test of continuous assessment, two possible procedures of qualification will be considered. The selected one will be the most favorable for each student in the two calls. The two procedures of weighing are:
a) Final score = theory exam x 0.2 + problem exam x 0.2 + continuous evaluation problems x 0.3 + continuous evaluation theory x 0.2 + lab practice x 0.1
b) Final score = theory exam x 0.5 + problem exam x 0.5

A grade greater than or equal to 4.0 in both the final theory exam and in the problem exam will be required in order to pass the subject in both weighting systems.

For the second call, the continuous evaluation grades obtained throughout the course are maintained, as well as the scores equal to or greater than 5.0 of the multiple-choice tests or problems exam obtained in the first call.

Those students who officially obtain the renounce of continuous assessment will do, on the official exam date of the two calls, a problem exam and a theory multiple-choice test, which will be weighted by 50% each of them in their grade. A grade greater than or equal to 4.0 in each exam will be a requirement.

IDENTIFYING DATA				
Materials science and technology				
Subject	Materials science and technology			
Code	V12G380V01301			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Figueroa Martínez, Raúl Abreu Fernández, Carmen María			
Lecturers	Abreu Fernández, Carmen María Álvarez Dacosta, Pedro Cortes Redin, María Begoña Feijoó Vázquez, Iria Figueroa Martínez, Raúl Guitián Saco, María Beatriz Iglesias Rodríguez, Fernando Pena Uris, Gloria María Riobó Coya, Cristina Vázquez Castro, Alfonso			
E-mail	cabreu@uvigo.es raulfm@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	The aim of this subject is to introduce the main concepts of materials technology as well as to study applications of the most common materials			

Competencies	
Code	
CG3	CG3 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.
CG4	CG4 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.
CG6	CG6 Capacity for handling specifications, regulations and mandatory standards.
CE9	CE9 Knowledge of the fundamentals of the science, technology and chemistry of materials. Understand the relationship between microstructure, the synthesis, processing and properties of materials.
CT1	CT1 Analysis and synthesis
CT5	CT5 Information Management.
CT9	CT9 Apply knowledge.
CT10	CT10 Self learning and work.

Learning outcomes	Competences		
It comprises the fundamental concepts of link, structure and microestructure of the distinct types of materials	CG3	CE9	CT10
It comprises the relation go in to microestructure of the material in his mechanical behaviour, electrical, thermal and magnetic	CG3	CE9	
It comprises the mechanical behaviour of the metallic materials, ceramic, plastics and compound	CG4 CG6		
It knows how they can modify the properties by means of mechanical processes and thermal treatments	CG4	CE9	CT9
It knows the basic technicians of structural characterisation of the materials	CG3 CG6	CE9	
It purchases skills in the handle of the diagrams and charts			CT1 CT5
It purchases skill in the realisation of essays	CG6	CE9	CT10
It analyses the results obtained and extracts conclusions of the same			CT1 CT9
It is able to apply norms of essays of materials	CG6		CT1 CT9

Contents	
Topic	
Introduction	Introduction to the Science and Technology of Material. Classification of the materials. Terminology. Orientations for the follow-up of the matter.
Crystalline arrangement.	Crystalline and amorphous solids. Crystalline lattices, characteristics and imperfections. Allotropic transformations.
Properties of materials. Laboratory practices.	Mechanical, chemical, thermal, electric and magnetic properties. Standars for materials analysis. Compressive and tensile deformation. Principles of fracture mechanisms. Toughness. Hardness. Main test methods. Introduction to metallography. Binary isomorphous and eutectic systems. Microstructure in eutectic alloys. Analyses of practical situations.
Metallic materials.	Solidification. Constitution of alloys. Grain size. Main binary phase diagrams. Processing. Carbon steels: classification and applications. Cast iron alloys. Heat treatments: ims, fundamentals and classification. Annealing, normalizing, quenching and tempering. Nonferreous alloys.
Polymers and composites	General concepts. Classification. Properties. Types of polymers. Processing. Classification of composite materials. Polymer matrix composite materials. Processing of composite materials. Problems related to polymeric and composite materials.
Ceramic materials	Structure and bonding in ceramic materials. Silicates structure. Glasses. Properties of ceramic materials. Processing of ceramic materials. Applications.

Planning	Class hours	Hours outside the classroom	Total hours
Introductory activities	1	0	1
Lecturing	31	56	87
Laboratory practical	18	18	36
Autonomous problem solving	0	12	12
Mentored work	0.5	7.95	8.45
Problem and/or exercise solving	1	0	1
Presentation	0.25	0	0.25
Report of practices, practicum and external practices	0	2	2
Self-assessment	0	0.3	0.3
Objective questions exam	2	0	2

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

Methodologies	Description
Introductory activities	A presentation of the course is made: contents, organization, methodologies to be used, schedule and evaluation system. Emphasis is placed on student participation and the personalized tutoring system.
Lecturing	During the academic course, the teacher exposes the main contents of the course, encouraging the active participation of the students. Exercises and type problems are solved, and hands on science methodology will be also applied.
Laboratory practical	Activities for the practical application of the knowledge acquired in the theoretical sessions. They are performed in the laboratory with specialized equipment and in accordance with applicable standards
Autonomous problem solving	Throughout the course, students will be offered different set of problems and questions that they will have to solve by themselves, demonstrating the capacity for learning and developing autonomous work.
Mentored work	The teacher will propose various assignments to be carried out in small groups. Throughout its development the teacher will guide and orient the students. Finally, the work must be presented in a public session in front of the teacher and all the classmates.

Personalized assistance	
Methodologies	**Description**
Lecturing	The teacher will guide and resolve any doubts that the student may have in relation to the contents explained in the lectures.
Laboratory practical	The laboratory teacher will guide the students in the development of the practical classes, clarifying their doubts and guiding them to achieve the best understanding of the practical classes

Mentored work	During the development of the tasks proposed to be done in small groups, the students will have the guidance and help of the teacher

Tests	Description
Problem and/or exercise solving	The students will have the support of the teacher to solve the doubts that can arise in the resolution of the numerical problems proposed in class, as well as those that are offered for their autonomous work.
Report of practices, practicum and external practices	The laboratory teacher will guide the students in the resolution of the questions formulated in the practical classes and will help in the doubts that may arise in the writing of the practical reports.
Self-assessment	The teacher will design the self-assessment tests that the student must take throughout the course, and will guide the students in their completion, solving the technical questions that may arise

Assessment

	Description	Qualification	Evaluated Competencess		
Laboratory practical	The attendance and active participation of the student in the practical sessions will be valued	0.5	CG3 CG6	CE9	CT1 CT9 CT10
Problem and/or exercise solving	The knowledges acquired in the practical sessions will be evaluated by means of test questions and problems	16	CG4 CG6	CE9	CT1 CT9 CT10
Presentation	The work carried out in small groups will be evaluated through their public defense. The search for information, the structuring of the work and the clarity of the presentation will be especially taken into account.	8	CG4 CG6	CE9	CT1 CT5 CT10
Report of practices, practicum and external practices	The student must present a report of the practical sessions which will include the results obtained in the mechanical tests as well as the answers to the questions asked.	1.5	CG6	CE9	CT9
Self-assessment	Resolution of proposed online questionnaires, which will consist of true and false questions and multiple choice questions	4	CG3	CE9	CT9 CT10
Objective questions exam	Student learning in this course will be evaluated by means of a written exam, which will consist of short answer questions, test questions and problems similar to those posed during the course.	70	CG3 CG4	CE9	CT1 CT5 CT9 CT10

Other comments on the Evaluation

Continuous assessment: The continuous assessment activities will be carried out during the teaching period and correspond to 30% of the grade.

Final Exam: counts for 70% of the course grade. The exam will be taken on the official date set by the EEI direction.

Requirements to pass the course:

It is necessary to achieve a minimum score of 40% in the final exam, that is 2.8 / 7.

If this minimum is not reached, the course will be considered as not passed and, although the sum of the exam grade and the continuous evaluation is higher than 5, the maximum grade that will be included in the academic records will be 4.5 points.

Renouncing continuous assessment: Students that do not follow the continuous assessment activities, after receiving authorization from the EEI direction, will be evaluated through a final exam on the contents of all the course, covering both lecture and labo contents, counting for 100% of the grade. A minimum mark of 5 (50%) will be required to pass the course.

July exam (2nd Edition): In the July edition, the continuous assessment marks will be also considered (only marks obtained in the current academic year). The characteristics of the exam will be the same as the first edition, and will be taken on the official date set by the EEI direction. Further in the July edition, the student can choose to be evaluated through a final exam on the contents of all the course, covering both lecture and labo contents, counting for 100% of the grade. A minimum mark of 5 (50%) will be required to pass the course. The student must notify the teacher of their choice well in advance.

Extraordinary Call: The extraordinary call exam contents will cover the entire course, including both lecture and labo contents, counting for 100% o the grade. A minimum mark of 5 (50%) will be required to pass the course.

Ethical commitment: Students are expected to carry out their work in accordance with an appropriate ethical behaviour. If the professor detects a behaviour that constitutes academic dishonesty (cheating, plagiarism, use of unauthorized electronic devices, for example) the student will be deemed not to meet all the criteria to pass the course, and will be informed that the final grade of this course will be FAIL (0.0). The use of any electronic device will not be allowed during the evaluation tests, unless expressly authorized. Introducing an unauthorized electronic device into the exam room will be considered reason enough for not passing the course in the present academic year, and the final grade will be: FAIL (0.0).

Attention: If there is any mismatch between the contents of the 3 language versions of this teaching guide, those included in the Spanish version will be considered valid.

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Basic Bibliography

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Recommendations

Subjects that continue the syllabus

Materials engineering/V12G380V01504

Subjects that are recommended to be taken simultaneously

Fundamentals of manufacturing systems and technologies/V12G380V01305
Fluid mechanics/V12G380V01405
Thermodynamics and heat transfer/V12G380V01302

Subjects that it is recommended to have taken before

Computer science: Computing for engineering/V12G350V01203
Physics: Physics I/V12G380V01102
Physics: Physics II/V12G380V01202
Mathematics: Algebra and statistics/V12G380V01103
Mathematics: Calculus I/V12G380V01104
Chemistry: Chemistry/V12G380V01205

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 ===
* Teaching methodologies maintained
All the lecture-based sessions will be maintained, moving them totally or partially to an online version, through the Online Campus (Campus Remoto) of the UVigo.
* Teaching methodologies modified
Laboratory sessions will be modified to adapt the group size to that set by the University or the EEI as safe. Sessions will be organized to ensure the safety distance. All the activities that can be performed in non face-to-face mode will be deployed on online platforms.
* Non-face-to-face student attention (tutoring)
Non-face-to-face tutorial services will be held through the virtual offices on the Online Campus, although the attention of the students may be carried out also by other ways (email, videoconference, Moovi forums, ...), always after previous agreement with the teacher.

* Modifications (if applicable) of the contents of the course
According to the moment when the University decision of starting non-face-to face or mix teaching is made, some reduction of the lab contents will need to be done, following the defined organization. Students will be informed of the changes through Moovi platform.
* Additional bibliography to facilitate self-learning
If student access to academic libraries is limited, additional documentation will be provided.

* Other modifications

=== ADAPTATION OF THE COURSE ASSESSMENT ===

* Tests already carried out
The marks obtained in the continuous assessment tests already performed will maintain their weight in the final grade without changes, as defined in the teaching guide.

* Pending tests that are maintained
- Those continuous assessment tests or exams that have not yet been done will also maintain their contribution in the final grade, as defined in the teaching guide. Exams will be held face-to-face if possible and will be adapted to take place fully online, if the applied contingency measures make it necessary.
* Tests that are modified
- Final exam: The final exam weight (70% of the course grade) can be modified depending on the date when the non face-to-face teaching is stablished. It can be reduced to a minimum contribution of 40% of the course grade.
- Students will be informed through Moovi of the change in the reweighting of the final exam, as well as the new tests that will be proposed to increase the weight of the continuous assessment.
- The final exam will be held face-to-face if possible but, if not, it will be adapted to be performed online.
* New tests
- In case of reducing the weight of the final exam mark in the course grade, new online tests and/or exercises will be proposed covering different items of the course syllabus and performed online using Moovi platform. The sum of the marks for the new tests and the final exam will contribute 70% to the course grade.
- Students will receive sufficient information in advance of the new tests and the grading procedure through Moovi platform.

IDENTIFYING DATA				
Thermodynamics and heat transfer				
Subject	Thermodynamics and heat transfer			
Code	V12G380V01302			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	2nd	1st
Teaching language	Spanish			
Department				
Coordinator	Sieres Atienza, Jaime Santos Navarro, José Manuel			
Lecturers	Pequeño Aboy, Horacio Román Espiñeira, Miguel Ángel Santos Navarro, José Manuel Sieres Atienza, Jaime Vidal López, Antonio José			
E-mail	jsieres@uvigo.es josanna@uvigo.es			
Web				
General description	Thermodynamics studies the energy, its transformations and the relationships among the properties of substances. Therefore, its knowledge is of primary importance for the analysis, design and construction of any thermal machine or equipment; and, in general, for the industrial applications of thermal engineering. On the other hand, it is interesting to know the mechanisms for energy transfer, mainly due to the existence of a temperature difference, with a focus in the three modes of heat transfer and the mathematical models that allow calculating the heat transfer rate. At the end of the course, students are expected to be able to properly state and solve heat transfer engineering problems.			

Competencies	
Code	
CG4	CG4 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.
CG5	CG5 Knowledge to carry out measurements, calculations, assessments, appraisals, surveys, studies, reports, work plans and other similar works.
CG6	CG6 Capacity for handling specifications, regulations and mandatory standards.
CG7	CG7 Ability to analyze and assess the social and environmental impact of the technical solutions.
CG11	CG11 Knowledge, understanding and ability to apply the necessary legislation in the exercise of the profession of Industrial Technical Engineer.
CE7	CE7 Knowledge of applied thermodynamics and heat transfer. Basic principles and their application to solving engineering problems.
CT2	CT2 Problems resolution.
CT7	CT7 Ability to organize and plan.
CT9	CT9 Apply knowledge.
CT10	CT10 Self learning and work.
CT17	CT17 Working as a team.

Learning outcomes	Competences		
Know and understand the Laws of Thermodynamics, the modes of heat transfer and the relations to calculate heat transfer rates	CG4 CG5 CG6 CG7	CE7	CT2 CT7 CT9 CT10 CT17
Know and understand the basic notions of the physics involved in the different modes of heat transfer	CG5 CG6 CG7 CG11	CE7	CT2 CT7 CT9 CT10 CT17
Identify the relevant heat transfer mechanisms involved in any heat transfer engineering application	CG4 CG6 CG7 CG11	CE7	CT2 CT7 CT9 CT10 CT17

Analyze thermal systems operation, such as heat pumps, refrigeration systems or power systems. Know the main components of these kinds of systems and the thermodynamic cycles used to model them	CG4 CG5 CG6 CG7 CG11	CE7	CT2 CT7 CT9 CT17

Contents
Topic
REVIEW OF THE FIRST And SECOND LAW OF THE THERMODYNAMICS
PROPERTIES OF PURE SUBSTANCES: TABLES And DIAGRAMS OF PROPERTIES
ANALYSIS OF OPEN SYSTEMS ACCORDING TO THE FIRST And SECOND LAW OF THE THERMODYNAMICS
APPLICATIONS OF THE ENGINEERING THERMODYNAMIC: POWER CYCLES And REFRIGERATION CYCLES
BASICS CONCEPTS And FUNDAMENTAL PRINCIPLES OF THE HEAT TRANSFER
HEAT TRANSFER BY CONDUCTION. ONE-DIMENSIONAL, STEADY-STATE HEAT FLOW
HEAT TRANSFER BY CONVECTION: FUNDAMENTALS And CORRELATIONS FOR CONVECTION HEAT TRANSFER COEFFICIENTS
HEAT TRANSFER BY RADIATION: FUNDAMENTALS. THERMAL RADIATION
INDUSTRIAL APPLICATIONS: HEAT EXCHANGERS

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	32.5	65	97.5
Laboratory practical	6	0	6
Autonomous problem solving	0	18.5	18.5
Problem solving	12	12	24
Problem and/or exercise solving	0	3	3
Objective questions exam	1	0	1
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Lecturing	Lectures introduction of the contents of the matter object of study
Laboratory practical	Real processes experimentations in the laboratory which complement the contents covered in the course.
Autonomous problem solving	Troubleshooting and / or exercises related to the subject that the student take place by consulting the literature
Problem solving	Troubleshooting and / or exercises related to the subject that the student take place in the classroom and/or laboratory. Examples of simple application of the contents studied as well as practical examples will be solved. The methodology will be focused on explaining how to solve the problems rather than on the determining the final numerical solution.

Personalized assistance	
Methodologies	**Description**
Lecturing	Students questions or doubts about any of the course contents will be solved during the instructors office hours
Laboratory practical	Students questions or doubts about any of the course contents will be solved during the instructors office hours
Problem solving	Students questions or doubts about any of the course contents will be solved during the instructors office hours

Assessment

	Description	Qualification	Evaluated Competencess		
Problem and/or exercise solving	Final written exam where students should solve lengthy response problems or exercies or theoertical questions about the course content. The exam durration and conditions will be established by the course teachers. Students should develop, relate, justify and present their knowledge and results including appropriate explanations. This exam will be take place in the dates fixed by the educational organisation of the centre Learning outcomes: know, understand and apply the principles and foundations of applied thermodynamics and heat transfer, including appropriate explanations to proposed solutions.	80	CG4 CG5 CG6 CG7	CE7	CT2 CT7 CT9 CT10
Objective questions exam	Throughout the semester several tests will be performed. The corresponding note will be based on short-answer written essays or tests. This note will correspond with the denomination of Continuous Evaluation	20	CG6	CE7	CT2 CT7 CT9 CT10

Other comments on the Evaluation

There are two evaluation modes that can be followed un order to passed this subject:

A) *Continuous Evaluation Mode* .

The final qualification (CF) of the student is determined by adding the points obtained in the final exam (EF) and those obtained by Continuous Evaluation (EC).

Each new enrollment in the course involves resetting the ratings in the continuous evaluation activities obtained in previous courses.

According to the Continuous Assessment Regulations, those students subject to the continuous evaluation mode that take part in any assessable activity included in the Subject Guide, will be considered as "presented" and will be taken into account for the final qualification of the course.

To carry out the different tests considered in the continuous evaluation mode (along the course) students are not allowed to use any kind of equation sheet or complementary document, neiter a calculatior.

These tests may be carried out during any of the course session hours (during classroom, problems or laboratory sessions) without previous notice.

The points achieved by continuous assessment will be valid in the first and the second calls/editions of the course.

B) *Non-continuous Evaluation Mode*

Those students that have renounced to be evaluated during the course (Continuous Evaluation) using the official procedure established by the Center, will be evaluated in the official dates set in the two calls/editions (same day and time) by a specific assesment.

This specific assessment will take into account all contents (theory, problems and laboratory practices) of the course, and will account for 100% of the maximum score. It will take place as follows:

1.- Written exam (EF), with a weight of 80% of the final qualification, identical to the final exam of all other students that follow the continuous evaluation mode.

2.- A Specific test (EC) , with a weight of 20% of the final qualification. This specific test will include both the contents of laboratory practice and the contents covered during the master sessions of the course. No supporting material will be allowed such as any kind of equation sheet, complementary document,or even a calculator. Any evidence about this specific test will be considered as assessable and it will imply that the student is not eligible for repeating this specific test.

The following qualification criteria apply to the two evaluation modes.

Qualification criteria:

A minimum number of points in the final exam is not required to take into account the points obtained during the course (Continuous Evaluation). In any case, it is necessary to obtain a final qualification greater or equal than 5 points in order to to pass the subject.

In the solutions proposed in the final exam, the students will have to justify or argue all the results that propose. The procedure used by the students during the solution of the differernt problems will also be taken into account.

None of the results obtained by the student will be "understood" by default.

The First Call/Edition: the final qualification is calculated as

CF =0.2·EC+0.8·EF

The Second Call/Ediciton: the final qualification is calculated as

CF =maximum(N1, N2), where

N1 = 0.2·EC + 0.8·EF

N2 = EF

The points obtained for the Continuous Evaluation (EC) during the first call (by any of the two evaulation modes) will also apply for the second call.

A score system from 0 to 10 points will be used (RD 1125/2003 de 5 de septiembre, BOEde 18 de septiembre)

'FINAL DE CARRERA' EXTRAORDINARY EXAM:

They will be able to have a format of distinct examination to the detailed previously. It will consist of a wirtten exam, where students should solve problems and/or answer theoretical questions about the most relevant contents of the course. It will allow students to obtain 100% of the maximum final qualification, being a minimum of 50% required in order to pass the course.

All tests, either during the course (continuous evaluation) or the final exam, must be done wit a pen, preferably blue. The use of a pencil or a red pen is not allowed. The use of electronic devices such as tablets, smartphones, laptops, etc, are also not allowed.

Ethical Comminmnet:

It might have a different format to the formerly detailed one.

In the event that an unethical behavior is detected (copying, plagiarism, unauthorized use of electronic devices, etc.), it will be considered that the student does not meet the necessary requirements to pass the subject. In that case, the overall rating in the current academic year will be 'fail (0.0)'.

The use of any electronic device during the different assesments or tests is not allowed, unless expressly authorized. The fact of introducing such an unauthorized device in the examination room will be considered as a reason for not passing the subject in the current academic year and the overall rating will be 'fail (0.0)'.

IMPORTANT NOTE: this is the english translation of the subject guide. In the event of any conflict between the English and Spanish versions, the Spanish version shall prevail.

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Complementary Bibliography
Çengel Y.A., **Introduction to Thermodynamics and Heat Transfer**, McGraw-Hill, 2008
Moran M.J. y Shapiro H.N., **Fundamentos de Termodinámica Técnica**, 2ª edición - castellano, Ed. Reverté, 2004
Merle C. Porter y Craig W. Somerton, **Termodinámica para ingenieros**, McGraw-Hill/Interamericana de España, 2004
Incropera F.P. y DeWitt D.P, **Introduction to Heat Transfer**, 2002
Wark, K. y Richards, D.E., **Termodinámica**, McGraw-Hill, 2010
Kreith J. y Bohn M.S, **Principios de Transferencia de Calor**, 2001,
Mills A.F., **Transferencia de calor**, 1995

Recommendations

Subjects that it is recommended to have taken before

Physics: Physics 2/V12G340V01202
Mathematics: Calculus 1/V12G340V01104
Mathematics: Calculus 2 and differential equations/V12G340V01204

Other comments

To enrol in this subject it will be necessary to have surpassed or to be enrolled in all the subjects of inferior courses.

Given the limitation of time for the "Thermodynamic and Heat Transfer" course, it is highly recommended that students have completed the course Física II or that they have the equivalent background in thermodynamics

IMPORTANT NOTE: this is the english translation of the subject guide. In the event of any conflict between the English and Spanish versions, the Spanish version shall prevail.

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 ===
* Teaching Methodologies maintained
UNCHANGED

* Teaching Methodologies modified
If the classroom attendance is suspended, the teaching methodologies (master class, seminars, problem classes, supervised work, presentations, etc.) will be carried out through the virtual means that the University of Vigo makes available to teachers to such an effect.

* Non-attendance mechanisms for student attention (tutoring):
The attention to the students in tutorials will be carried out at fixed and published time of the tutorials but through an "appointment" managed by email. In this way the tutoring will be carried out through the virtual means that the University of Vigo proposes and enables the teaching staff for this purpose, see virtual office of the teacher in Campus Remoto

* Modifications (if they proceed) of the contents to give
UNCHANGED

* Additional bibliography to facilitate self-learning:
None

* Other modifications:
None

=== ADAPTATION OF THE EVALUATION ===

In case to exist a situation of sanitary alarm and by part of the competent authority (sanitary administrations and the own institution of Rectorado) decree the no classroom attendance, is possible that splits of the educational contents evaluate by means of other tasks that will have a weight of 20%, what does that the evaluation of the course remain with the following percentages:

Tests "Objective questions exam" -> 20%

Tests "Problem and/or exercise solving" -> 60%

"Additional Tasks" -> 20%

IDENTIFYING DATA				
Fundamentos de electrotecnia				
Subject	Fundamentos de electrotecnia			
Code	V12G380V01303			
Study programme	Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	2	1c
Teaching language	Castelán			
Department	Enxeñaría eléctrica			
Coordinator	Albo López, María Elena			
Lecturers	Albo López, María Elena Parajo Calvo, Bernardo José Sueiro Domínguez, José Antonio			
E-mail	ealbo@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	Os obxectivos que se perseguen con esta materia son: - Adquisición dos coñecementos referidos a símbolos, magnitudes, principios, elementos básicos e leis da electricidade. - Coñecemento de técnicas e métodos de análises de circuítos con excitación continua e en réxime *estacionario *senoidal - Descrición de sistemas *trifásicos. - Coñecemento dos principios de funcionamento e características das distintas máquinas eléctricas.			

Competencias	
Code	
CG3	CG3 Coñecemento en materias básicas e tecnolóxicas que os capacite para a aprendizaxe de novos métodos e teorías, e os dote de versatilidade para adaptarse a novas situacións.
CE10	CE10 Coñecemento e utilización dos principios de teoría de circuítos e máquinas eléctricas.
CT1	CT1 Análise e síntese.
CT2	CT2 Resolución de problemas.
CT6	CT6 Aplicación da informática no ámbito de estudo.
CT10	CT10 Aprendizaxe e traballo autónomos.
CT14	CT14 Creatividade.
CT16	CT16 Razoamento crítico.
CT17	CT17 Traballo en equipo.

Resultados de aprendizaxe			
Learning outcomes		Competences	
Comprender os aspectos básicos do funcionamento dos circuítos e as máquinas eléctricas.	CG3	CE10	
Coñecer o proceso experimental utilizado cando se traballa con circuítos eléctricos e máquinas eléctricas			CT1 CT2
Coñecer as técnicas actuais dispoñibles para a análise de circuítos eléctricos		CE10	CT6
Coñecer as técnicas de medida de circuítos eléctricos			CT6 CT10
Adquirir habilidades sobre o proceso de análise de circuítos eléctricos			CT1 CT2 CT10 CT14 CT16 CT17

Contidos	
Topic	
INTRODUCIÓN.	Carga, corrente, potencial eléctrico, enerxía e potencia eléctrica, lei de Ohm, lei de Joule, leis de Kirchoff. Elementos Ideais. Asociación serie, paralelo de elementos ideais
ELEMENTOS REAIS.	Elementos Pasivos Reais (Resistencia, Bobina, Condensador)
FONTES E TEOREMAS FUNDAMENTAIS.	Modelos de Fontes Reais. Conversión de Fontes Reais. Teoremas Fundamentais: Linealidade, Substitución, Superposición, Thévenin e Norton.
MÉTODOS SISTEMÁTICOS DE ANÁLISES.	Nós e mallas

REGIMEN ESTACIONARIO SENOIDAL	Formas de onda e parámetros asociados, fasores, impedancias/admitancias. Asociación de impedancias/admitancias. Comportamento dos elementos no R.E.S
POTENCIA E ENERXÍA EN R.E.S	Potencias: complexa, activa, reactiva, aparente. Teorema de Boucherot. Factor de Potencia. Compensación de Potencia Reactiva
SISTEMAS TRIFÁSICOS EQUILIBRADOS	Valores de liña e fase. Redución ao monofásico equivalente. Potencia. Medida de Potencia Activa e Reactiva
TRANSFORMADORES MONOFÁSICOS E TRIFÁSICOS.	Constitución, circuíto equivalente, índice horario.
MÁQUINAS ASÍNCRONAS	Constitución. Xeración do campo xiratorio. Circuíto Equivalente. Curvas Características. Manobras
MAQUINAS DE ALTERNA MONOFÁSICAS	Constitución. Principio de funcionamento. Aplicacións.
MAQUINAS SÍNCRONAS.	Constitución. Funcionamento en baleiro e en carga. Sincronización.
MÁQUINAS DE CORRENTE CONTINUA.	Constitución. Circuítos Equivalentes. Curvas características
PRÁCTICAS	INTRODUCIÓN E SEGURIDADE 1. Descrición do laboratorio. Seguridade eléctrica 2. Equipos de medida (polímetro, pinza amperimétrica, vatímetro dixital, osciloscopio dixital, analizador de rede) e de xeración (fonte DC, fonte AC, fonte trifásica) utilizados no laboratorio. Métodos para realizar as medidas de tensión, intensidade, potencia con efectividade e seguridade. BLOQUE TEORÍA DE CIRCUÍTOS 3. Asociacións de elementos. Equivalencia estrela-triángulo. 4. Elementos Reais: resistencia, bobina núcleo aire, bobina núcleo ferro, condensador, transformador. 5. Circuíto RLC serie e paralelo. Media de tensións, intensidades, potencias. Determinación de Impedancia/Admitancia Equivalente. 6. Compensación de Reactiva en Circuítos RL serie e paralelo. 7. Sistema trifásico equilibrado. Concepto de valores de liña e fase. Medida de Potencias en cargas trifásicas. BLOQUE MÁQUINAS ELÉCTRICAS 8. Ensaios na máquina asíncrona trifásica. Determinación do circuíto equivalente 9. Máquinas de corrente continua. Constitución e principio de funcionamento. Aplicacións

Planificación			
	Class hours	Hours outside the classroom	Total hours
Lección maxistral	22	44	66
Resolución de problemas	10	10	20
Prácticas de laboratorio	20	10	30
Resolución de problemas de forma autónoma	0	20	20
Exame de preguntas de desenvolvemento	4	0	4
Informe de prácticas, prácticum e prácticas externas	0	10	10
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente	
	Description
Lección maxistral	O profesor exporá nas clases de aula os contidos da materia.
Resolución de problemas	Exporanse e resolverán problemas e exercicios tipo nas clases de aula como guía para o alumnado.
Prácticas de laboratorio	Realizaranse no laboratorio montaxes prácticas correspondentes aos contidos vistos na aula, ou ben se tratarán aspectos complementarios non tratados nas clases teóricas.
Resolución de problemas de forma autónoma	É moi aconsellable que o alumno trate de resolver pola súa conta exercicios e cuestións da materia propostos polo profesorado.

Atención personalizada	
Methodologies	**Description**
Resolución de problemas	O profesor atenderá persoalmente as dúbidas e consultas dos alumnos.
Prácticas de laboratorio	O profesor atenderá persoalmente as dúbidas e consultas dos alumnos.

Avaliación					
	Description	Qualification	Evaluated Competencess		
Lección maxistral	Avaliarase o nivel de seguimento por parte do alumnado dos contidos da materia. A este efecto desenvolveranse durante o curso polo menos dúas probas curtas a realizar descontando o tempo do dedicado ás clases de aula. Cada proba constará dun conxunto de pequenos exercicios para os cales cada alumno/a proporá unha resposta, si é correcta (e o exercicio está resolto/xustificado) conta como un acerto e si é errónea ou se deixa en branco non puntúa, cada proba valórase entre 0 e 10 puntos. A avaliación das probas curtas é a media aritmética das puntuacións obtidas, está comprendida entre 0 e 10. A primeira desas probas comprende até Métodos Sistemáticos de Análises e a segunda inclúe R.E.S. en sistemas monofásicos e trifásicos. En caso de realizarse algunha outra proba, o profesor/a determinará os contidos a avaliar.	30	CG3	CE10	CT1 CT2 CT10 CT16
Exame de preguntas de desenvolvemento	O exame constará de dous problemas, un deles da parte de Teoría de Circuítos e outro da parte de Máquinas Eléctricas. Cada sección avaliarase entre 0 e 10 puntos esixíndose un mínimo de 3 puntos en cada unha delas para poder aprobar a materia.	60	CG3	CE10	CT1 CT2 CT6 CT10 CT14 CT16
Informe de prácticas, prácticum e prácticas externas	Valorarase a realización das prácticas e a resolución dun cuestionario referido á montaxe, resultados obtidos e interpretación dos mesmos. A non asistencia á práctica leva asociada a cualificación de cero puntos na práctica, independentemente que o estudante entregue o correspondente cuestionario/informe.	10	CG3	CE10	CT1 CT2 CT6 CT10 CT14 CT16 CT17

Other comments on the Evaluation

A nota numérica final obtense pola media ponderada dos elementos anteriores:

Nota = 0,3 * Probas curtas + 0,1 * Prácticas + 0,6 * Exame

Se pola aplicación da media ponderada anterior a nota final é superior a 4,5 puntos, pero non se cumpre a condición de alcanzar un mínimo de 3 puntos en cada parte do exame final, a nota máxima será de 4,5 puntos. .

AVALIACIÓN CONTINUA:

Tanto a realización das probas, como a asistencia ás prácticas e entrega dos cuestionarios dos mesmos, son actividades de avaliación continua, avaliando a primeira con ata 3 puntos ea segunda con ata 1 punto na nota final.

Na facultade desta materia considérase xustificado que o alumno poida realizar un exame final con opcións para aspirar ao grao máis alto posible, para que os estudantes que desexen mellorar a cualificación correspondente á avaliación continua poidan facer un exame adicional despois do exame. xeral, que incluirá cuestións relacionadas cos contidos tanto da docencia de clase como de laboratorio, e que pode ser ata o 40% da cualificación final coa mesma distribución que se outorga na avaliación continua, nese exame adicional pode recuperar unha das partes ou ambas. En caso de facelo, a nota que se terá en conta para avaliar as actividades de avaliación continua será a nota máis alta obtida (durante o curso / exame adicional).

O alumno que desexe renunciar ás actividades correspondentes á avaliación continua ten un prazo para facelo fixado pola dirección da escola, nese caso a nota máxima que se pode esperar co exame final é de 6,0 puntos sobre 10, con todo, pode aumentar a súa cualificación realizando o exame adicional mencionado no parágrafo anterior.

Para a segunda oportunidade de xuño a xullo mantense a cualificación na avaliación continua obtida na primeira oportunidade, sen prexuízo de que, como na primeira oportunidade de decembro a xaneiro, pódese superar coa realización do exame adicional que é propoñer a tal efecto. A nota que se terá en conta para avaliar as actividades de avaliación continua será a nota máis alta obtida.

Cada nova matrícula na materia implica unha redución a cero das cualificacións nas actividades de avaliación continua obtidas nos cursos anteriores.

Compromiso ético:

Estudante deberá presentar un comportamento ético axeitado. En caso de detectar un comportamento non ético (copia, plaxio, uso de dispositivos electrónicos non autorizados, por exemplo) considerarase que o alumno non cumpre os requisitos necesarios para aprobar a materia. Dependendo do tipo de comportamento non ético detectado, poderíase concluír que o alumno non alcanzou as competencias B2, B3 e CT19.

Bibliografía. Fontes de información

Basic Bibliography

Suárez Creo, J. Albo López E, **Apuntes F.Electrotecnia**,

Súarez Creo, J. , Albo López, E, **Ejercicios Resueltos de F. Electrotecnia**,

Complementary Bibliography

Jesús Fraile Mora, **Circuitos Eléctricos**, 2015,

Gómez Expósito, Martínez Ramos y otros, **FUNDAMENTOS DE TEORÍA DE CIRCUITOS**, 2007,

Suarez Creo J. y Miranda Blanco B.N., **MÁQUINAS ELÉCTRICAS. FUNCIONAMIENTO EN RÉGIMEN PERMANENTE**, 2006,

Jesús Fraile Mora, **Máquinas eléctricas**, 2015,

Jesús Fraile Mora, **Problemas de máquinas eléctricas**, 2015,

Recomendacións

Subjects that continue the syllabus

Tecnoloxía eléctrica/V12G340V01804
Compoñentes eléctricos en vehículos/V12G340V01902
Oficina técnica/V12G340V01307

Subjects that it is recommended to have taken before

Física: Física I/V12G340V01102
Física: Física II/V12G340V01202
Matemáticas: Álxebra e estatística/V12G340V01103
Matemáticas: Cálculo I/V12G340V01104

Other comments

É moi recomendable que os alumnos teñan coñecementos suficientes da álxebra dos números complexos e coñecementos básicos de teoría de circuítos:

 En concreto, esta materia parte e apóiase dos contidos estudados en Física II, realizando un mero repaso no primeiro tema Introdución daqueles aspectos relacionados directamente coa Teoría Circuítos, primeiro bloque didáctico de Fundamentos de Electrotecnia. É por tanto recomendable, para o correcto seguimento da materia, ter aprobada Física II.
 Por outra banda, todo o cálculo en R.E.S., que abarca o 80% do curso, realízase aplicando operacións de números complexos (suma, resta, multiplicación, división, conxugado.), por tanto é fundamental dominar a álxebra de números complexos (Matemáticas I) para poder seguir adecuadamente esta materia.

Por todo iso, é conveniente superar as materias dos cursos inferiores ao curso en que está situado esta materia, especialmente Matemáticas I e Física II, antes de matricularse de Fundamentos de Electrotecnia.

Plan de Continxencias

Description

=== MEDIDAS EXCEPCIONAIS PLANIFICADAS ===
Ante a incerta e imprevisible evolución da alerta sanitaria provocada polo COVID-19, a Universidade de Vigo establece unha planificación extraordinaria que se activará no momento en que as administracións e a propia institución determíneno atendendo a criterios de seguridade, saúde e responsabilidade, e garantindo a docencia nun escenario non presencial ou parcialmente presencial. Estas medidas xa planificadas garanten, no momento que sexa preceptivo, o desenvolvemento da docencia dun modo máis áxil e eficaz ao ser coñecido de antemán (ou cunha ampla antelación) polo alumnado e o profesorado a través da ferramenta normalizada e institucionalizada das guías docentes.

=== ADAPTACIÓN DAS METODOLOXÍAS ===
* Metodoloxías docentes que se manteñen
En caso de docencia virtual ou mixta, mantéñense as mesmas metodoloxías docentes que en docencia presencial utilizando os medios telemáticos que a Universidade pon a disposición do profesorado e do alumnado (Faitic, Campus Remoto e/oCampus Integra, programas informáticos, etc.)

* Metodoloxías docentes que se modifican
As prácticas de laboratorio substitúense por tarefas usando gravacións de prácticas reais ou programas informáticos de simulación eléctrica.

* Mecanismo non presencial de atención ao alumnado (tutorías)
As tutorías, en caso de docencia virtual ou mixta, desenvolveranse de forma telemática mediante o uso das ferramentas telemáticas dispoñibles (faitic, correo electrónico, Campus Remoto, Campus Integra, teléfono, etc.)

* Modificacións (si proceden) dos contidos a impartir
ningunha

* Bibliografía adicional para facilitar o auto-aprendizaxe
ningunha

* Outras modificacións
ningunha

=== ADAPTACIÓN DA AVALIACIÓN ===
* Probas xa realizadas
As probas presenciais realizadas manteñen o seu valor e peso na avaliación global

* Probas pendentes que se manteñen
As probas pendentes de realizarse mantéñense co seu valor e peso na avaliación global, realizándose a través das distintas ferramentas postas a disposición do profesorado e alumnado (faitic, correo electrónico, Campus Remoto,
Campus Integra, teléfono, etc.)

* Probas que se modifican
ningunha

* Novas probas
ningunha

* Información adicional
Mantéñense os criterios de avaliación adecuados á realización das probas, no caso de ser necesario e por indicación en Resolución Reitoral, usando os medios telemáticos postos a disposición do profesorado

IDENTIFYING DATA				
Deseño de máquinas I				
Subject	Deseño de máquinas I			
Code	V12G380V01304			
Study programme	Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	3	2c
Teaching language	Castelán			
Department	Enxeñaría mecánica, máquinas e motores térmicos e fluídos			
Coordinator	López Lago, Marcos Collazo Rodríguez, Joaquín Baltasar			
Lecturers	Collazo Rodríguez, Joaquín Baltasar Fernández Álvarez, José Manuel López Lago, Marcos Suárez Eiroa, David			
E-mail	mllago@uvigo.es joaquincollazo@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	Esta materia permitirá ao alumno aplicar os fundamentos básicos da Teoría de Máquinas e Mecanismos ao Deseño de Máquinas e coñecer, comprender, aplicar os conceptos relacionados co Deseño de Máquinas e a súa aplicación na Enxeñaría Mecánica. Achegaralle coñecementos, sobre os conceptos máis importantes relacionados co Deseño de Máquinas. Coñecerá e aplicará as técnicas de análises para Deseño de Máquinas, tanto analíticas como mediante a utilización eficaz de software de simulación.			

Competencias	
Code	
CG4	CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial na especialidade de Mecánica.
CG5	CG5 Coñecementos para a realización de medicións, cálculos, valoracións, taxacións, peritaxes, estudos, informes, planes de labores e outros traballos análogos.
CG6	CG6 Capacidade para o manexo de especificacións, regulamentos e normas de obrigado cumprimento.
CG9	CG9 Capacidade de organización e planificación no ámbito da empresa, e outras institucións e organizacións.
CG10	CG10 Capacidade para traballar nun medio multilingüe e multidisciplinar.
CG11	CG11 Coñecemento, comprensión e capacidade para aplicar a lexislación necesaria no exercicio da profesión de Enxeñeiro Técnico Industrial.
CE13	CE13 Coñecemento dos principios de teoría de máquinas e mecanismos.
CE20	CE20 Coñecementos e capacidades para o cálculo, deseño e ensaio de máquinas.
CT2	CT2 Resolución de problemas.
CT9	CT9 Aplicar coñecementos.
CT10	CT10 Aprendizaxe e traballo autónomos.
CT17	CT17 Traballo en equipo.

Resultados de aprendizaxe			
Learning outcomes	Competences		
Aplicar os fundamentos básicos da Teoría de Máquinas e Mecanismos ao Deseño de Máquinas	CG4 CG5 CG6 CG9 CG10 CG11	CE13 CE20	CT2 CT9 CT10 CT17
Coñecer, comprender, aplicar os conceptos relacionados co Deseño de Máquinas	CG4 CG5 CG6 CG9 CG10 CG11	CE13 CE20	CT2 CT9 CT10 CT17

Contidos
Topic

Deseño mecánico	1. Deseño fronte a solicitacions estáticas 2. Deseño fronte a solicitacions dinámicas
Transmisións	3. Introdución aos sistemas de transmisión 4. Engranaxes (cilíndricos, cónicos, parafusos sen-fin) 5. Eixos e Árbores
Elementos de Máquinas	6. Embragues e Freos 7. Unións roscadas e parafusos de potencia 8. Coxinetes de deslizamento e rodaxe

Planificación

	Class hours	Hours outside the classroom	Total hours
Resolución de problemas	9	30	39
Prácticas de laboratorio	18	47	65
Lección maxistral	23	19.5	42.5
Resolución de problemas e/ou exercicios	2.5	0	2.5
Resolución de problemas e/ou exercicios	1	0	1

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

Metodoloxía docente

	Description
Resolución de problemas	Resolución de problemas utilizando os conceptos teóricos presentados en aula.
Prácticas de laboratorio	Realización de tarefas prácticas en laboratorio docente ou aula informática.
Lección maxistral	Clase maxistral na que se expoñen os contidos teóricos.

Atención personalizada

Methodologies	Description
Lección maxistral	ATENCION DE DÚBIDAS E PREGUNTAS FORMULADAS POLO ALUMNO
Resolución de problemas	ATENCION DE DÚBIDAS E PREGUNTAS FORMULADAS POLO ALUMNO
Prácticas de laboratorio	ATENCION DE DÚBIDAS E PREGUNTAS FORMULADAS POLO ALUMNO

Avaliación

	Description	Qualification	Evaluated Competencess		
Prácticas de laboratorio	Valorarase a asistencia e a participación do alumno nas prácticas de laboratorio, as memorias das prácticas de laboratorio e os traballos realizados a partir delas.	20	CG4 CG5 CG6 CG9 CG10 CG11	CE13 CE20	CT2 CT9 CT10 CT17
Resolución de problemas e/ou exercicios	Avaliarase en exame final/parciais enfocados aos problemas correspondentes aos coñecementos impartidos durante as clases de aula e laboratorio.	60	CG4 CG5 CG6 CG9 CG10 CG11	CE13 CE20	CT2 CT9 CT10 CT17
Resolución de problemas e/ou exercicios	Avaliarase en exame final/parciais enfocados aos contidos correspondentes aos coñecementos impartidos durante as clases de aula e laboratorio.	20	CG4 CG5 CG6 CG9 CG10 CG11	CE13 CE20	CT2 CT9 CT10 CT17

Other comments on the Evaluation

A materia aprobarase se se obtén unha cualificación* igual ou maior que un 5 como nota final, da seguinte forma: A asistencia con aproveitamento ao Laboratorio/Aula informática/Aula equivalente, a cualificación das memorias entregadas/cuestionarios en cada práctica e os traballos desenvolvidos, terán unha valoración máxima de 2 puntos da nota final, esta cualificación conservarase na segunda convocatoria. Para sumar a nota de prácticas precísase a asistencia a un mínimo de 7 prácticas.

Para os alumnos que soliciten e obteñan de maneira oficial o dereito a perda de avaliación continua, existirá un exame final

de laboratorio, previa solicitude ao profesor da materia duas semanas antes do exame final de 1ª edición, cunha valoración máxima de 2 puntos.

O exame final consistirá na resolución de problemas e preguntas de resposta curta, sendo a repartición de 60% e 20% da nota final simplemente orientativo, dependendo de cada convocatoria. O exame terá unha valoración máxima de 8 puntos da nota final.

Compromiso ético: Espérase que o alumno presente un comportamento ético axeitado. No caso de detectar un comportamento non ético (copia, plaxio, utilización de aparatos electrónicos non autorizados, e outros) considerarase que o alumno non reúne os requisitos necesarios para superar a materia. Neste caso a cualificación global no presente curso académico será de suspenso (0.0).
Non se permitirá a utilización de ningún dispositivo electrónico durante as probas de avaliación salvo autorización expresa. O feito de introducir un dispositivo electrónico non autorizado na aula de exame será considerado motivo de non superación da materia no presente curso académico e a cualificación global será de suspenso (0.0).
*Empregarase un sistema de cualificación numérica de 0 a 10 puntos segundo a lexislación vixente (RD 1125/2003 de 5 de setembro, BOE de 18 de *setiembre).

Bibliografía. Fontes de información

Basic Bibliography

Norton, R., **Diseño de Máquinas. Un Enfoque Integrado**, Mc Graw Hill,

Budynas, R.G., **Diseño en ingeniería mecánica de Shigley**, McGraw-Hill,

Complementary Bibliography

Mott, Robert L., **Diseño de elementos de máquinas**, Pearson,

Hamrock, Bernard J, et al., **Elementos de Máquinas**, Mc Graw Hill,

Avilés, R., **Métodos de cálculo de fatiga para ingeniería. Metales.**, Paraninfo,

Lombard, M, **Solidworks 2013 Bible**, Wiley,

Recomendacións

Subjects that it is recommended to have taken before

Ciencia e tecnoloxía dos materiais/V12G360V01301
Resistencia de materiais/V12G360V01404
Teoría de máquinas e mecanismos/V12G360V01303

Other comments

Para matricularse nesta materia é necesario ter superado ou ben estar matriculado de todas as materias dos cursos inferiores ao curso no que está emprazada esta materia.

Para un seguimento adecuado da materia, os estudantes matriculados deben dispor dun ordenador persoal portátil e acceso a internet. O alumnado que non dispoña dalgún destes medios deberá informalo ao coordinador da materia para atopar solucións. Cando sexa necesario, facilitaranse licenzas de estudante do software empregado na materia.

En caso de discrepancias, prevalecerá a versión en castelán desta guía.

Plan de Continxencias

Description

=== MEDIDAS EXCEPCIONAIS PLANIFICADAS ===

Ante a incerta e imprevisible evolución da alerta sanitaria provocada pola COVID- 19, a Universidade establece una planificación extraordinaria que se activará no momento en que as administracións e a propia institución o determinen atendendo a criterios de seguridade, saúde e responsabilidade, e garantindo a docencia nun escenario non presencial ou non totalmente presencial. Estas medidas xa planificadas garanten, no momento que sexa preceptivo, o desenvolvemento da docencia dun xeito mais áxil e eficaz ao ser coñecido de antemán (ou cunha ampla antelación) polo alumnado e o profesorado a través da ferramenta normalizada e institucionalizada das guías docentes DOCNET.

=== ADAPTACIÓN DAS METODOLOXÍAS ===

* Adaptacións das Metodoloxías docentes
No caso da imposibilidade do desenvolvemento da Docencia íntegramente presencial, a Docencia desenvolverase de forma mixta ou enteramente virtual mediante o uso de Faitic e Campus Virtual ou outro medio equivalente. Neste caso, as metodoloxías y contidos podrán sufrir axustes ou adaptacións a este entorno docente.

* Mecanismo non presencial de atención ao alumnado (titorías)
No caso da imposibilidade do desenvolvemento da docencia íntegramente presencial, as titorías desenvolvéranse mediante o uso de Campus Virtual ou outro medio equivalente, na modalidade de concertación previa.

* Modificacións dos contidos a impartir
No caso da imposibilidade do desenvolvemento da Docencia íntegramente presencial, os contidos podrán sufrir axustes ou adaptacións.

=== ADAPTACIÓN DA AVALIACIÓN ===

No caso da imposibilidade de la realización do exame final presencial ou no caso do desenvolvemento da Docencia en formato íntegramente non presencial en mais de 2/3 do curso modificanse, os pesos/probas de esta asignatura, quedando finalmente:

Evaluación Continua mediante Cuestionarios de Prácticas: 30 %
Trabalos a determinar: 30 % (nota mínima para puntuar 1.25 sobre 3 puntos)
Exame final (se fora necesario modalidade virtual): 40 % (nota mínima para puntuar 1.5 sobre 4 puntos)

* Probas xa realizadas o planificadas
Evaluación Continua mediante Cuestionarios de Prácticas: [Peso anterior: 20%] [Peso Proposto: 30%]

* Probas pendentes que se manteñen
Exame final (se fora necesario modalidade virtual): [Peso anterior: 80%] [Peso Proposto: 40%]

* Nuevas probas
Traballos a determinar que se evaluarán dentro da evaluación continua cun Peso dun 30 %.

IDENTIFYING DATA				
Fundamentals of manufacturing systems and technologies				
Subject	Fundamentals of manufacturing systems and technologies			
Code	V12G380V01305			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	2nd	1st
Teaching language	Spanish			
Department				
Coordinator	Diéguez Quintas, José Luís			
Lecturers	Areal Alonso, Juan José Ares Gómez, José Enrique Diéguez Quintas, José Luís Fenollera Bolíbar, María Inmaculada Pérez García, José Antonio			
E-mail	jdieguez@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	The educational aims of Foundations of Systems and Technologies of Manufacture, in his fundamental and descriptive appearances, centre in the study and the application of scientific knowledges and technicians related with the processes of manufacture of components and conjoint whose functional purpose is mechanical, as well as the evaluation of his dimensional precision and the one of the products to obtain, with a determinate quality. All this including from the phases of preparation until the ones of utilisation of the instruments, the tools, toolings, teams, machines tool and necessary systems for his realisation, in accordance with the norms and specifications established, and applying criteria of optimisation. To reach the aims mentioned will give the following thematic educational: - Foundations of dimensional metrology. Measure of length, angles, forms and elements of machines. - Study, analysis and evaluation of the dimensional tolerances. Chain of tolerances. Optimisation of the tolerances. Systems of adjust and tolerances. - Processes of conformed of materials by means of start of material, operations, scheme, teams and tooling - Processes of conformed by means of plastic deformation, operations, scheme, teams and tooling - Processes of conformed by *moldeo, operations, scheme, teams and tooling - Processes of conformed no conventional, operations, scheme, teams and tooling. - Conformed of polymers, and other no metallic materials, operations, scheme, teams and tooling - Processes of union and assembling, operations, scheme, teams and tooling - Foundations of the programming of scheme with *CNC, used in the mechanical manufacture.			

Competencies	
Code	
CG3	CG3 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.
CE15	CE15 Basic knowledge of production systems and manufacturing.
CT2	CT2 Problems resolution.
CT8	CT8 Decision making.
CT9	CT9 Apply knowledge.
CT10	CT10 Self learning and work.
CT17	CT17 Working as a team.
CT20	CT20 Ability to communicate with people not expert in the field.

Learning outcomes			
Learning outcomes		Competences	
(*)		CE15	CT2 CT9 CT10 CT20
New	CG3	CE15	CT2 CT10
New		CE15	CT2 CT8 CT17

New	CG3	CE15	CT2 CT8 CT9 CT17 CT20

Contents	
Topic	
DIDACTIC UNIT 1. INTRODUCTION To THE TECHNOLOGIES And SYSTEMS OF MANUFACTURE.	Lesson 1. INTRODUCTION To THE ENGINEERING OF *FABRICACION. The productive cycle. Classification of industries. Technologies of manufacture.
DIDACTIC UNIT 2. *METROTECNIA.	Lesson 2. PRINCIPLES OF DIMENSIONAL METROLOGY. Introduction. Definitions and concepts. The International System of Units. Physical magnitudes that covers the Dimensional Metrology. Elements that take part in the measurement. Classifications of the methods of measure. Patterns. The chain of *trazabilidad. *Calibración. Uncertainty. Chain of *calibración and transmission of the uncertainty. Relation between tolerance and uncertainty. Expression of the uncertainty of measure in *calibración. Lesson 3. INSTRUMENTS And METHODS OF MEASURE. Introduction. Patterns. Instruments of verification. Patterns *interferométricos. Principles of *interferometría. Instruments of direct measure. Methods and instruments of indirect measure. Lesson 4. MEASUREMENT BY COORDINATES. MEASUREMENT BY IMAGE. SUPERFICIAL QUALITY. Machines of measurement by coordinates. Concept. Principles of the MMC. Classification of the machines. Main components of the MMC. Process to be followed for the development of a measure. Systems of measurement by image. Superficial quality. Methods of measure of the *rugosidad. Parameters of *rugosidad.
DIDACTIC UNIT 3. PROCESSES OF CONFORMED BY START OF MATERIAL	Lesson 5. INTRODUCTION To THE CONFORMED BY START OF MATERIAL. Introduction. Movements in the process of start of material. Factors to take into account in the election of the tool. Geometry of tool. Materials of tool. Mechanism of training of the shaving. Types of shavings. Power and strengths of court. Wear of tool. Criteria of wear of tool. Determination of the life of the tool. Flowed of court. Lesson 6. TURNING: OPERATIONS, SCHEME And TOOLING. Introduction. Main operations in lathe. The machine-tool: the lathe. Main parts of the lathe. Setting or subjection of pieces. Typical tools of the lathe. Special lathes. Lesson 7. MILLED: OPERATIONS, MACHINES And TOOLING. Introduction. Description and classification of the operations of milled. Parts and main types of *fresadoras. Types of strawberries. Setting of the tool. Subjection of pieces. Different configurations of *fresadoras. *Fresadoras Special. Lesson 8. MECHANISED OF HOLES And WITH RECTILINEAR MAIN MOVEMENT: OPERATIONS, MACHINES And TOOLING. Introduction to the operations of mechanised of holes. Punches. *Mandrinadoras. General characteristics of the processes of mechanised with rectilinear main movement. *Limadora. *Mortajadora. *Cepilladora. *Brochadora. Saws. Lesson 9. CONFORMED WITH ABRASIVE: OPERATIONS, MACHINES And TOOLING. Introduction to the operations of mechanised of holes. You grind abrasive. Operation of rectified. Types of *rectificadoras. *Honeado. *Lapeado. Polishing. Burnished. *Superacabado Lesson 10. PROCESSES OF MECHANISED NO CONVENTIONAL. Introduction. The mechanised by electroerosion or *electro-download. Mechanised electrochemical. Mechanised by laser. Mechanised by *chorro of water. Court by arch of plasma. Mechanised by ultrasounds. Milled chemist.

DIDACTIC UNIT 4. AUTOMATION And MANAGEMENT OF THE PROCESSES OF MANUFACTURE.	Lesson 11. NUMERICAL CONTROL OF MACHINES TOOL. Introduction. Advantages of the application of the *CN in the machines tool. Necessary information for the creation of a program of *CN. Manual programming of *MHCN. Types of language of *CN. Structure of a program in code ISO. Characters employed. Preparatory functions (G__). Auxiliary functions (M__). Interpretation of the main functions. Examples. Automatic programming in numerical control.
DIDACTIC UNIT 5. PROCESSES OF CONFORMED OF MATERIALS IN LIQUID STATE And GRANULATE.	Lesson 12. GENERAL APPEARANCES OF THE CONFORMED BY FOUNDRY OF METALS. Introduction. Stages in the conformed by foundry. Nomenclature of the main parts of the mould. Materials employed in the conformed by foundry. Flow of the fluid in the system of feeding. Solidification of the metals. Contraction of the metals. The *rechupe. Procedure of calculation of the system distribution of *colada. Considerations on design and defects in pieces melted. Lesson 13. PROCESSES OF MANUFACTURE BY FOUNDRY. Classification of the processes of foundry. *Moldeo In sand. *Moldeo In shell. *Moldeo In plaster. *Moldeo In ceramics. *Moldeo To the CO2. *Moldeo To the stray wax Foundry in full mould. *Moldeo *Mercast. *Moldeo In permanent mould. Foundry injected. Foundry *centrifugada. Ovens employed in foundry. Lesson 14. METALLURGY OF DUSTS (*PULVIMETALURGIA). Introduction. Manufacture of the metallic dusts. Characteristics and properties of the metallic dusts. Dosage and mix of metallic dusts. *Compactación. *Sinterizado. Ovens of sintering. *Sinterizado By download *disruptiva. *Presinterizado. Back operations. Considerations of design. Products *obtenibles by sintering. Lesson 15. CONFORMED OF PLASTICS. Introduction. Polymeric material classification. Physical properties of polymers. Classification of the processes. *Moldeo By extrusion. *Moldeo By injection. *Moldeo By compression. *Moldeo By transfer. *Moldeo Rotational. *Termoconformado.
DIDACTIC UNIT 6. PROCESSES OF CONFORMED BY UNION.	Lesson 16. PROCESSES OF WELDING. Introduction to the processes of welding. Welding with electrical arch. Welding by resistance. Welding with oxygen and gas fuel .Welding with temperature of fusion of metal of lower contribution that the one of the metals to join. Lesson 17. PROCESSES OF UNION And SETTING WITHOUT WELDING. Processes of union by means of adhesive. Resistance to the adhesion. Conditions for the hit. Design of unions Types of adhesive according to origin and composition. Processes of mechanical union. Removable mechanical unions and permanent.

DIDACTIC UNIT 7. PROCESSES OF CONFORMED BY PLASTIC DEFORMATION OF METALS.	Lesson 18. GENERAL APPEARANCES OF THE CONFORMED BY PLASTIC DEFORMATION. Introduction. Curves of effort-deformation. Expressions of the deformation. Proof of the volume. Approximate models of the curve encourage real-natural deformation. State of flat deformation. Primary and secondary processes. Processes of work in hot and in cold. Conditions and control of the process. Lesson 19. PROCESSES OF *LAMINACIÓN And FORGES. *Laminación: Foundations; temperature of *laminación; teams for the *laminación in hot; characteristics, quality and tolerances of the products *laminados in hot; *laminación in cold. It forges: free; in matrix of impression; in press; by *recalcado; header in cold; by *laminación; in cold. Lesson 20. EXTRUSION, *EMBUTICIÓN And AFFINE. Extrusion. Pulled of bars and tubes. *Trefilado. Reduction of section. *Embutición. *Repujado In lathe. Attainable pieces by *repujado: considerations of design. Forming by pulled. Forming with pads of rubber and with liquid to pressure. Forming to big power. Lesson 21. CONFORMED OF METALLIC SHEET. *Curvado Or bent of sheets. *Curvado With rollers. Conformed with rollers. *Enderezado. *Engatillado. Operations of cut of sheet.
PROGRAM OF PRACTICES	Practice 1.- Utilisation of the conventional devices of metrology. Measurement of pieces using foot of normal king and of depths and micrometer of outsides and inner. Employment of clock comparator. *Comprobación Of flat surfaces. Use of calibrate raisin/does not happen, rules, squares and *calas pattern. Measurement and *comprobación of threads. Realisation of metric measurements and in English units. Practice 2.-Indirect measurements. *Comprobación Of a cone using rollers and a foot of king, measurement of a tail of *milano using rollers, measurement of the angles of a double tail of *milano and measurements using a rule of breasts. Direct measurements with goniometer. Practice 3.- Machine of measurement by coordinates. Establish a system of coordinates. Check measures in piece, using a machine to measure by coordinates. Verify tolerances forms and position. Practice 4.- Manufacture with machines conventional tools. Manufacture of a piece employing the lathe, the *fresadora and the *taladro conventional, defining the basic operations and realising them on the machine. Practice 5.- Selection of conditions of computer-aided court. Realisation of leaves of process of three pieces using program of planning of Practical computer-aided processes 6, 7 and 8.- Initiation to the numerical control applied to the lathe and to the *fresadora. Realisation of a program in *CNC using a simulator, with the main orders and simpler; realising at the end diverse pieces so much in the lathe as in the *fresadora of the classroom workshop. Practice 9.- Welding. Knowledge of different teams of electrical welding. *Soldeo Of different materials employed the technicians of electrode *revestido, *TIG and *MIG.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	32.5	0	32.5
Laboratory practical	18	0	18
Objective questions exam	0	2	2
Laboratory practice	0	50	50

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

Methodologies

Description

Lecturing	The theoretical classes will realise combining the explanations of blackboard with the employment of videos and presentations of computer. The purpose of these is to complement the content of aim them, interpreting the concepts in these exposed by means of the sample of examples and the realisation of exercises.
Laboratory practical	The practical classes of laboratory will realise in 9 sessions of 2 hours, except the students of the course bridge that will realise the practices in the 6 sessions that contemplates his particular schedule, in groups of 20 maximum students, and employing the available resources of instruments and machines, combining with the simulations by computer.

Personalized assistance

Methodologies	Description
Lecturing	
Laboratory practical	

Tests	Description
Objective questions exam	
Laboratory practice	

Assessment

	Description	Qualification	Evaluated Competencess
Objective questions exam	It TESTS TYPE To (for all the students -60% final note-) The character of this proof is written and face-to-face, is compulsory for all the students, with or without continuous evaluation. It will be composed this proof by 20 ask type test on the theoretical and practical contents. The assessment of tests it type test will realise in a scale of 6 points, what represents 60% of the total note, being necessary to obtain at least 2 points, so that together with the practical proofs can obtain at least 5 points and surpass the matter The note of this test will obtain adding 0,3 points by each properly answered question and will subtract 0,1 points if the question is resolved of wrong form. The questions in white do not mark.	60	CG3 CE15 CT8 CT9 CT10
Laboratory practice	It TESTS TYPE *B (continuous evaluation -30% final note-): Two test type test to realise in the schedule of class, consistent in 5 questions on the matter given until the moment, each correct question will cost 0,3 points and the wrong will subtract 0,1 points. The questions in white do not mark. Each proof will be therefore 15% of the final note. It TESTS TYPE C (continuous evaluation -10% final note-): A proof written or work to propose by the professor along the *cuatrimestre. This proof will value with a maximum of 1 point, 10% of the final note. These notes will add to the qualification of tests it type test, to be able to obtain at least 5 points and surpass the matter. It TESTS TYPE (renunciation to the continuous evaluation -40% final note-): Resolution of several practical problems, whose value will be 40% of the final note, or was at most 4 points, being necessary to obtain a minimum of 1 point in this second proof so that the qualification can add to the one of tests it type test, and if it equalises or surpasses 5 points, approve the matter. This tests type D, will realise it the students to which have conceded them the renunciation to the continuous evaluation, and will realise the same day that realise tests it compulsory test, after this have finalised.	40	CE15 CT2 CT8 CT9 CT10 CT17 CT20

Other comments on the Evaluation

<*p>APPROVED</*p><*p>Students described by means of continuous evaluation:</*p><*p>To surpass this matter is necessary at least obtain 5 points adding the punctuation of test them types □To□, □*B□ and □C□. </*p><*p>All the students in principle will have to follow the procedure of continuous evaluation, except those that on purpose renounce in the term and form that mark the school. </*p><*p>&*nbsp;Students described with renunciation conceded to the continuous evaluation:</*p><*p>To surpass this matter is necessary at least obtain 5 points adding the punctuation of test them types □To□ and □D□.</*p><*p>ASSISTANCE To PRACTICAL CLASSES</*p><*p>The assistance to practical classes is not compulsory, but will be always matter of examination the in them given.</*p><*p>ANNOUNCEMENT OF 2º EDITION</*p><*p>Students with continuous evaluation, qualification in the announcement of 2º edition: </*p><*p>&*nbsp;This second edition of the ordinary announcement will describe as the following way: </*p><*p>- By means of the realisation of the compulsory proof type □To□ </*p><*p>- conserve the qualifications of the two test type □*B□ in this 2ª opportunity, but will be able to , if it wishes , improve this qualification, by means of the repetition of these

test type □*B□ when finalising tests it type □To□.</*p><*p>- Will keep the punctuation reached in tests it type □C□ by maximum value of 1 point, but will be able to improve this note if it wishes by means of a proof written or work to propose by the professor, to deliver before the day of the announcement of this second edition.</*p><*p>To surpass this matter is necessary at least obtain 5 points adding the three previous proofs. </*p><*p>The notes of the proofs of continuous evaluation, corresponding to 40% of the final qualification, will not conserve of a course for another. </*p><*p>Students without continuous evaluation, qualification in the announcement of 2º edition: </*p><*p>The students that do not realise continuous evaluation, due to the fact that the centre has accepted them the renunciation, always will have to realise in all the announcements tests it type □To□ (by value of 6 points) and tests it type □D□ (by value of 4 points), in the terms specified in the previous sections. </*p><*p>To surpass this matter is necessary at least obtain 5 points adding the two previous proofs. </*p><*p>EXTRAORDINARY ANNOUNCEMENT: </*p><*p>This proof will be equal for all the students and will consist in one tests it type □To□ (by value of 6 points) and tests it type □D□ (by value of 4 points), in the terms specified in the previous sections. </*p><*p>To surpass this matter is necessary at least obtain 5 points adding the two previous proofs. </*p><*p>ETHICAL COMMITMENT:</*p><*p>expects that the present student a suitable ethical behaviour, free of fraud. In case to detect a no ethical behaviour (copy, plagiarism, utilisation of unauthorised electronic devices, for example) will consider that the student does not gather the necessary requirements to surpass the matter. In this case the global qualification in the present academic course will be of suspense (0.0).</*p>

Sources of information

Basic Bibliography

Complementary Bibliography

Dieguez, J.L.; Pereira, A.; Ares, J.E:, **´Fundamentos de fabricación mecánica**,

Alting, L., **Procesos para ingenieria de manufactura**,

De Garmo; Black; Kohser, **Materiales y procesos de fabricación**,

Kalpakjian, Serope, **Manufactura, ingeniería y tecnología**,

Lasheras, J.M., **Tecnología mecánica y metrotecnia**,

Recommendations

Subjects that continue the syllabus

Manufacturing engineering and dimensional quality/V12G380V01604

Subjects that are recommended to be taken simultaneously

Materials science and technology/V12G350V01305

Other comments

Requirements: To enrol of this matter is necessary to have surpassed or be enrolled of all the matters of the inferior courses to the course to the that is *emplazada this matter.

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

Contingency plan

Description

The contents and the results of learning will not owe to be modified for power guarantee the collected in the memories of the qualifications. It owes to treated to adjust the materials, tutorships and the teaching methodologies to treat to achieve these results. It treats of an aspect of big importance stop the overrun of the processes of the one who are subjected the different qualifications. And say, the plan of contingency owes to based in a development of the subject, adapting the methodologies and the materials, in the research of the fulfilment of the resulted of learning of all the students.

The teaching methodologies will impart , to be necessary, to the telematic means that put the disposal of the teaching staff, in addition to the documentation facilitated through FAITIC and other platforms, email, etc.

When it was not possible to presential sesions, in the measure of the possible, will prevail the contained theorists by telematic means as well as those contents of practices of resolution of problems, classroom of computing, and others, that can be virtuals or developed pole students of way guided, tried keep the presential stop the experimental practices of laboratory, always that the groups fulfil with the rule established in the moment by the authorities in sanitary subject and of security. In the case of no power be imparted of form presential, those contents no virtuals will impart or by others (autonomous work guided, etc.) Enabling achieve equally the competitions associated it they. The titorships will be able to developed indistinctly of form presential (always that it was possible to guarantee the sanitary measures) or telematic (and email and others) respecting or adapting the schedules of titorships due. it will do a adecuation methodological to the students of risk, facilitating him additional specific information, to accredit that can not have access to the contained imparted of conventional form.

Additional information envelope to evaluation: they will keep those proofs that already come realizing of telematic form and, in the measure of the possible, will keep the proofs presentials to the normative valid medic. The proofs will develop of form presential except Resolution Reitoral that indicate that they owe do of form non-presential, realizing gave way through the distinct tools put the disposal of the teaching staff. Those proofs no-don of telematic form by others (deliveries of autonomous work guided, etc.)

IDENTIFYING DATA				
Mechanism and machine theory				
Subject	Mechanism and machine theory			
Code	V12G380V01306			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	2nd	1st
Teaching language	Spanish Galician English			
Department				
Coordinator	Fernández Vilán, Ángel Manuel Segade Robleda, Abraham			
Lecturers	Fernández Vilán, Ángel Manuel Segade Robleda, Abraham Suárez Eiroa, David			
E-mail	asegade@uvigo.es avilan@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	This subject is intended to provide the students with basic knowledge about Mechanism and Machine Theory as well as his applications in the field of Mechanical engineering. It also covers and provides the students with the most important concepts related with Mechanism and Machine Theory. The students will know and apply kinematic and dynamic analysis methods for mechanical systems both with graphical and analytical methods and also through effective use of simulation software. Furthermore, this subject serves as an introduction of some aspects about machinery design; a topic that will be cover thoroughly in future subjects of the Degree.			

Competencies	
Code	
CG3	CG3 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.
CG4	CG4 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.
CE13	CE13 Knowledge of the principles of the theory of machines and mechanisms.
CT2	CT2 Problems resolution.
CT6	CT6 Application of computer science in the field of study.
CT9	CT9 Apply knowledge.
CT10	CT10 Self learning and work.
CT16	CT16 Critical thinking.

Learning outcomes	Competences		
To know the fundamentals of Mechanism and Machines Theory, and the application of these concepts concerning to the field of Mechanical engineering to solve problems related with this subject in the Industrial Engineering field.	CG3 CG4	CE13	CT2 CT6 CT9 CT10 CT16
To know, comprehend, apply, and practice the concepts related to Mechanism and Machines Theory.	CG3 CG4	CE13	CT2 CT6 CT9 CT10 CT16
To know and apply kinematic and dynamic analyses techniques to mechanical systems.	CG3 CG4	CE13	CT2 CT6 CT9 CT10 CT16
Efficiently know and utilize software for analysis of mechanisms.	CG3 CG4	CE13	CT2 CT6 CT9 CT10 CT16

Contents

Topic	
Introduction to mechanism and machine theory	Introduction Definition of Machine, Mechanism and Kinematic Chain Link/part and linkage/joint Classification Kinematic Diagram, modeling, and symbology (nomenclature) Mobility Degrees of freedom Synthesis of mechanisms
Geometrical analysis of mechanisms.	Introduction Calculation methods of placement Loop closure equations
Kinematic analysis of mechanisms	Fundamentals Graphical methods Analytical methods Matrix methods
Static analysis of mechanisms	Fundamentals Force reduction (Graphical Methods) Work/Power Virtual Methods
Dynamic analysis of mechanisms	Fundamentals Machine general dynamics Machine Work and Power Balanced Dynamics of rotors
Cam mechanisms	Fundamentals Flat cams Cam synthesis
Power transmission mechanisms	Fundamentals Gears Mechanism Other mechanisms

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	23	19.5	42.5
Problem solving	9.5	30	39.5
Laboratory practical	18	47	65
Essay questions exam	3	0	3
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Lecturing	Master class where the theoretical concepts are explain
Problem solving	Problem solving using the theoretical concepts presented in the Master Lesson
Laboratory practical	Practical tasks developed at the teaching laboratory or computer lab.

Personalized assistance	
Methodologies	**Description**
Lecturing	Group or individual tutorials will be held during office hours to strengthen the acquired knowledge and to guide and assess the proposed works/papers .
Problem solving	Group or individual tutorials will be held during office hours to strengthen the acquired knowledge and to guide and assess the proposed works/papers.
Laboratory practical	Group or individual tutorials will be held during office hours to strengthen the acquired knowledge and to guide and assess the proposed works/papers.

Assessment					
	Description	Qualification	Evaluated Competencess		
Laboratory practical	Attendance and participation as well as practices reports, papers, and tests will be rated. However, to be evaluated, students must attend a minimum of 7 practice sessions; otherwise, students won't be evaluated and will get 0 points. Learning outcomes: all will be graded	20	CG3 CG4	CE13	CT2 CT6 CT9 CT10 CT16

Essay questions exam	Final and mid-term tests will be focused on the contents taught at classes and laboratory sessions. Learning outcomes: all will be graded.	80	CG3 CG4	CE13	CT2 CT9 CT10 CT16

Other comments on the Evaluation

Students must achieve a 5 or higher grade* to pass the subject, following these rules:

- Laboratory Practical.
  - Students are required to attend and utilized the laboratory/Computer room. Practices reports, papers, and tests for each practice session as well as proposed works/papers from tutorials will be evaluated and graded with a maximum of 2 points of the final grade. This grade will be kept for the second term in the student's evaluation records (July). To be evaluated, students must attend a minimum of 7 practice sessions; otherwise, students won't be evaluated and will get 0 points.
  - For those students who have been officially granted the right to waive their continued evaluation, there will be a mandatory final test where they will be able to get a maximum grade of 2 points. However, an advanced request must be made to the professor to prepare the necessary materials for this test.
- Essay questions exam. It will have a maximum grade of 8 points.

* Grades are calculated using a system of numerical qualification from 0 to 10 points conforming to the Spanish current legislation (RD 1125/2003, 5 September; BOE 18 September).

Ethical commitment: An adequate ethical behaviour of the student is expected at all times. In case an unethical behaviour is detected (copying, plagiarism, unauthorized use of electronic devices, and others); the student will be considered unfit to meet the necessary requirements to pass the subject. In this case, the overall qualification in the current academic year will be a Fail grade (0.0).

The use of any electronic devices during tests is completely forbidden unless is specified and authorized. The fact of introducing unauthorized electronic devices in the examination room will be considered reason enough to fail the subject in the current academic year and the overall qualification will be a Fail grade (0.0).

Tests Schedule: This information can be found along with any updates at the center (university) webpage.

Sources of information

Basic Bibliography

Munir Khamashta, **Problemas resueltos de cinemática de mecanismos planos**, UPC,
Munir Khamashta, **Problemas resueltos de dinámica de mecanismos planos**, UPC,
Calero Pérez, R. y Carta González, J.A., **Fundamentos de mecanismos y máquinas para ingenieros**, McGraw-Hill,

Complementary Bibliography

García Prada, J.C. Castejón, C., Rubio, H., **Problemas resueltos de Teoría de Máquinas y mecanismos**, THOMSON,
Cardona, S. y Clos D., **Teoría de Máquinas.**, UPC,
Shigley, J.E.; Uicker J.J. Jr., **Theory of Machines and Mechanisms**, McGraw-Hill,
Hernández A, **Cinemática de mecanismos: Análisis y diseño**, SÍNTESIS,
Lamadrid Martínez, A.; Corral Sáiz, A., **Cinemática y Dinámica de Máquinas**, E.T.S.I.I.T,
Mabie, Reinholtz, **Mechanisms and dynamics of machinery**, Limusa-wyley,
Nieto, j., **Síntesis de Mecanismos**, AC,
Erdman, A.G.; Sandor, G.N.,, **Mechanism Design: Analysis and Synthesis**, PRENTICE HALL,
Simon A.; Bataller A; Guerra .J.; Ortiz, A.; Cabrera, J.A., **Fundamentos de teoría de Máquinas**, BELLISCO,
Kozhevnikov SN, **Mecanismos**, Gustavo Gili,

Recommendations

Subjects that continue the syllabus

Machine design I/V12G380V01304
Automobiles and railways/V12G380V01941
Design of hydraulic machines and oleo-pneumatic systems/V12G380V01914
Machine design II/V12G380V01911
Computer-aided mechanical design/V12G380V01915
Transport engineering/V12G380V01945
Thermal engines and machines/V12G380V01913
Systems for data analysis, simulation and validation/V12G380V01933

Subjects that it is recommended to have taken before

Graphic expression: Graphic expression/V12G380V01101
Physics: Physics I/V12G380V01102
Mathematics: Algebra and statistics/V12G380V01103
Mathematics: Calculus I/V12G380V01104
Mathematics: Calculus II and differential equations/V12G380V01204

Other comments

Requirements: to enrol in this subject, it is mandatory to have passed or at least, to be enrolled of all first year subjects.
In case of discrepancies, the Spanish version of this guide prevails.

Contingency plan

Description

In the event that attendance to classes become legally entirely or partially limited, the measures set on place will be:

1. To guarantee the necessary means, namely personal computer or internet access, to every enrolled student so they can follow the distance learning classes, appropriately. Therefore, to apply the appropriate solutions, any student who does not have any of these means should inform the course coordinator.

2. To inform students of the different measures adopted, the department will use the platform, Faitic.

3. On top of that, in the case of cancelation of face-to-face classes, the teaching guide will show the next modifications:
A. Competences. They will not be modified.
B. Learning outcomes. They will not be modified.
C. Contents. They will not be modified.
D. Planning. It will not be modified.
E. Methodology. It will be modified:
Lecturing and Problem solving. They will require the employment of electronic means (virtual classroom of the Remote Campus or others).
Laboratory Practices. The department will provide every student access to dynamic simulation software, so that they can carry out the practices remotely instead of from the Mechanical Engineering laboratory. The professor will supervise these practices using electronic means (virtual classroom of the Remote Campus or others).
F. Tutoring Lessons. They will be carried out by previously arranged electronic means.
G. Assessment. Assessment methodologies/test will not be modified: Laboratory practical and Essay questions exam. Description, qualification, and competences, they will not be modified. All exams will use electronic means (virtual classroom of the Remote Campus or others); the department will publish in advance the specific rules for each test in the platform, Faitic. According to attendance at the virtual practice sessions, the professor will compute and validate each practice attendance on virtual classroom of the Remote Campus.
Partial tests for the evaluation of specific contests of the subject can be proposed. Once again, the professor will publish in advance the rules concerning each test in the platform, Faitic.
H. Bibliography. Besides the bibliographical references found in this guide, the documentation provided at Faitic, and the problem bulletins and previous exams, the professor might facilitate additional notes, videos, web-references, and others, so that students can appropriately follow the course during the non-face-to-face classes.
This guide can be modified following Rectoral rules.

IDENTIFYING DATA				
Environmental technology				
Subject	Environmental technology			
Code	V12G380V01401			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	2nd	1st
Teaching language	#EnglishFriendly Spanish Galician English			
Department				
Coordinator	Álvarez da Costa, Estrella			
Lecturers	Álvarez da Costa, Estrella Cameselle Fernández, Claudio Escudero Curiel, Silvia Moldes Menduíña, Ana Belén Moldes Moreira, Diego Moure Varela, Andrés Rosales Villanueva, Emilio Salgado Seara, José Manuel Yañez Diaz, Maria Remedios			
E-mail	ealvarez@uvigo.es			
Web	http://moovi.uvigo.gal			
General description	Subject that belongs to the Block of Common Subjects of the Industrial Technologies. It is part of the curricula of all Degrees of Industrial Engineering. The main objective is to achieve a basic knowledge about the Treatment and management of solid wastes, wastewaters and pollutant emission to the atmosphere. It includes also the concepts of pollution prevention and sustainability. Subject of the "English Friendly" program. International students may request the teachers Remedios Yañez Diaz, Diego Moldes Moreira and Claudio Cameselle Fernández (M2, M3 ad M5 groups, respectively): a) Materials and bibliographic references for the follow-up of the subject in English. b) Attend tutorials in English. c) Tests and evaluations in English.			

Competencies	
Code	
CG7	CG7 Ability to analyze and assess the social and environmental impact of the technical solutions.
CE16	CE16 Basic knowledge and application of environmental technologies and sustainability.
CT1	CT1 Analysis and synthesis
CT2	CT2 Problems resolution.
CT3	CT3 Oral and written proficiency.
CT9	CT9 Apply knowledge.
CT10	CT10 Self learning and work.
CT12	CT12 Research skills.
CT17	CT17 Working as a team.
CT19	CT19 Sustainability and environmental commitment. Equitable, responsible and efficient use of resources.

Learning outcomes	Competences	
Basic knowledge and application of environmental technologies and sustainability	CE16	CT2 CT3 CT10 CT19
Problem solving	CE16	CT2 CT3 CT10 CT19

Oral and writing communication		CE16	CT2 CT3 CT10
Knowledge application to practical and real cases		CE16	CT2 CT3 CT10 CT19
Analysis and synthesis		CE16	CT1 CT2 CT3 CT9 CT10 CT12 CT17 CT19
Ability to analyze and determine the social and environmental impact of the technical solutions to environmental problems		CG7	CT1 CT3 CT9 CT10 CT17 CT19

Contents	
Topic	
Lesson 1: Introduction to the environmental technology.	1. Material cycle economy. 2. Introduction to the best available techniques (BAT).
Lesson 2: Management of waste and effluents.	1. Generation of waste. Types and classification of wastes. 2. Codification of wastes. 3. Urban waste management. 4. Industrial waste management. Industrial waste treatment facilities. 5. Regulations
Lesson 3: Treatment of urban and industrial wastes.	1. Valorization. 2. Physico-chemical treatment. 3. Biological treatment. 4. Thermal treatment. 5. Landfilling. 6. Soil remediation technologies.
Lesson 4: Treatment of industrial and municipal wastewaters.	1. Characteristics of municipal and industrial wastewaters. 2. Wastewater treatment plant. 3. Sludge treatment. 4. Water treatment and reuse 5. Regulations
Lesson 5: Atmospheric pollution.	1. Types and origin of atmospheric pollutants. 2. Dispersion of pollutants in the atmosphere. 3. Effects of the atmospheric pollution. 4. Treatment of polluting gas emissions. 5. Regulations
Lesson 6: Sustainability and environmental impact assessment	1. Sustainable development 2. Life cycle analysis and economy. 3. Ecological footprint and carbon footprint. 4. Introduction to the environmental impact assessment
Practice 2: Preparation of immobilized activated charcoal for use as an adsorbent.	
Practice 1: Codification of wastes	
Practice 3: Contaminants removal by adsorption with immobilized activated charcoal.	
Practice 4: Coagulation-flocculation: Establishment of optimal working conditions.	
Practice 5: Simulation of certain stages of an EDAR.	
Practice 6: Life Cycle Analysis of a product.	

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	26	52	78
Problem solving	11	22	33

Laboratory practical	12	12	24
Objective questions exam	1	0	1
Problem and/or exercise solving	2	0	2
Report of practices, practicum and external practices	0	6	6
Case studies	0	6	6

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

Methodologies

	Description
Lecturing	Teaching in the classroom of the key concepts and procedures for learning the syllabus contents
Problem solving	Solving exercises with the teacher's help and independently
Laboratory practical	Application of the knowledge acquired to the resolution of problems of environmental technology, using equipment and facilities available in the laboratory/computer room.

Personalized assistance

Methodologies	Description
Laboratory practical	In tutorials, students can consult with their teacher any questions about laboratory practices or the report of practices to be done. The tutoring schedule of the teaching staff will be public and accessible to the students.
Lecturing	In tutorials, students can consult with their teacher any questions arising in the lectures and related to the contents seen in them The schedule of tutorials of teachers will be public and accessible to students.
Problem solving	In tutorials, students can consult their teacher any questions about the resolution of problems raised in the classroom. The tutoring schedule of the teaching staff will be public and accessible to the students.

Assessment

	Description	Qualification	Evaluated Competencess		
Objective questions exam	"FINAL EXAM" consisting of theoretical questions related to the syllabus of the subject. CG7, CE16 and CT19 competences will be assessed in this exam, based on student responses to the questions. CT1, CT3 and CT10 competences are also evaluated, since the exam is written and requires students' analysis and synthesis skills.	30	CG7	CE16	CT1 CT3 CT10 CT19
Problem and/or exercise solving	"FINAL EXAM" consisting of problems related to the syllabus of the subject. CT2, CT9 and CT19 competences will be assessed in this exam, based on the resolution of various exercises of environmental technology, which require the use of applied knowledge related to the contents of the subject. CT1, CT3 and CT10 competences are also evaluated, since the exam is written and requires students' analysis and synthesis skills.	30			CT1 CT2 CT3 CT9 CT10 CT19
Report of practices, practicum and external practices	Detailed report for each practices that includes the results and their discussion. The competences: CG7, CE16, CT1, CT3, CT9 and CT10, are assessed based on the quality of the written report elaborated by each student on his/her own. The following points will be evaluated in the report: text style and correctness, structure and presentation, analysis and discussion of the results, and conclusions. Competences CT12 and CT17 will be assessed based on the laboratory work. Lab practices will be carried out in pairs, and it is expected the student develop research skills in the field of environmental technology. The written report must be done in pairs.	10	CG7	CE16	CT1 CT3 CT9 CT10 CT12 CT17

Case studies	All exercises, seminars, practical cases and theoretical / practical tests that are made and delivered to the teacher throughout the course, related to the concepts and contents of the syllabus. Throughout a four-month time several tests are performed. Competences CG7 and CE16 will be assessed considering the students answers to the theoretical questions. Competences CT2, CT10 and CT12 will be assessed considering the students answers to the exercises. Competenci CT3 will be assessed base on the two parts of the exam: theory and exercises; considering the precision and clarity of the answers.	30	CG7 CE16	CT2 CT3 CT10 CT12

Other comments on the Evaluation

Evaluation:

A student who choose continuous assessment, to pass the course, must achieve a **MINIMUN SCORE** of **4.0 points** (out of10) ***in each of the parts of the "FINAL EXAM"*** , ie, theory (Objective questions exam) and problems (Problem and/orexercise solving). If a student reaches the minimum grade in both parts of the "FINAL EXAM", to pass the subject must obtain a **FINAL GRADE** of **≥ 5.0**, that is, when the sum of grades of the "Practice report", "Case study" and the "FINAL EXAM" (Exam of objective questions + Problem solving and/or exercises) is ≥ 5.0.

Students who "*officially renounces continuous assessment*", will make a "FINAL EXAM" (Objective questions exam + Problemand/or exercise solving) that will be worth 90% of the final grade, and a "EXAM OF PRACTICES" that will be worth 10% of the final grade. In any case, to pass the course, the student must achieve 50% of the maximum score in each of the constituentparts of the subject, ie, theory, problems and practices.

Second call:

In the second call the same criteria apply.

In relation to the July exam, grades of the "Case studies" and "Practices report" are maintained, and students only have to repeat the "FINAL EXAM", ie, "Objective questions exam" + "Problem and/or exercise solving".

If, at the 1st call, a student suspended one of the parts of the "FINAL EXAM" (theory or problems) and approves the other party with a grade ≥ 6, on the July exam, you only need to repeat the suspended part.

Ethical commitment:

The student is expected to present an adequate ethical behavior. If you detect "unethical behavior" (copying, plagiarism, unauthorized use of electronic devices, etc.) shall be deemed that the student does not meet the requirements for passing the subject. In this case the final grade, in the current academic year, will FAIL (0.0 points).

The use of electronic devices during the assessment tests will be allowed. The fact of introducing into the examination room an unauthorized electronic device, will be reason not pass the course in the current academic year, and the final grade will FAIL (0.0 points)

Sources of information

Basic Bibliography

Mihelcic, J.R. and Zimmerman, J. B., **Environmental Engineering: Fundamentals, sustainability, design**, Wiley, 2014

Davis, M.L. and Masten S.J., **Principles of Environmental Engineering and Science**, McGraw-Hill, 2014

Metcalf & Eddy, **Ingeniería de aguas residuales : tratamiento, vertido y reutilización**, McGraw-Hill, 1998

Acosta, J.A. et al., **Introducción a la contaminación de suelos**, Mundi-prensa, 2017

Complementary Bibliography

Tchobanoglous, G., **Gestión integral de residuos sólidos**, McGraw-Hill, 1996

Nemerow, N. L., **Tratamiento de vertidos industriales y peligrosos**, Diaz de Santos, 1998

Baird, C y Cann M., **Química Ambiental**, Reverté, 2014

Kiely, G., **Ingeniería Ambiental: fundamentos, entornos, tecnología y sistemas de gestión**, McGraw-Hill, 2001

Castells et al., **Reciclaje de residuos industriales: residuos sólidos urbanos y fangos de depuradora**, Díaz de Santos, 2009

Albergaria, J.M. and Nouws H.P.A., **Soil remediation**, Taylor and Francis, 2016

Sharma, H. D., and Reddy, K. R., **Geoenvironmental engineering: site remediation, waste containment, and emerging waste management technologies**, John Wiley & Sons, 2004
Wark and Warner, **Contaminación del aire: origen y control**, Limusa, 1996
Jonker, G. y Harmsen, J., **Ingeniería para la sostenibilidad**, Reverté, 2014
Azapagic, A. and Perdan S., **Sustainable development in practice: Case studies for engineers and scientists**, Wiley, 2011
Reddy, K.R., Cameselle, C. and Adams, J.A., **Sustainable Engineering: Drivers, Metrics, Tools, and Applications**, Wiley, 2019

Recommendations

Subjects that it is recommended to have taken before

Physics: Physics 1/V12G360V01102
Physics: Physics 2/V12G360V01202
Chemistry: Chemistry/V12G380V01205

Other comments

Recommendations:
To enroll in this subject is necessary to have passed or be enrolled in all subjects of previous courses to the course that is located this subject.

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 ===

* Teaching methodologies maintained
All teaching methodologies planned will be maintained, although they would be adapted to remote teaching.

The " lectures" would be online, via the Remote Campus, Faitic or any other platform that the University of Vigo wouldprovide to the academic staff.

Of all " laboratory practices " initially planned, those non-experimental ones would be maintained, while the others would bereplaced by on-line practices.

* Non-attendance mechanisms for student attention (tutoring)
Tutoring would be online, in the teacher's "virtual office" or by e-mail. In any case, students should previously arrange withtheir teacher (by e-mail) the tutoring date.

* Modifications (if applicable) of the contents
In a virtual context, the three experimental practices would be replaced by online ones, maintaining the same contents.

=== ADAPTATION OF THE TESTS ===

In a virtual context, no changes would be required in the assessment criteria, or in the weighting of each test, in relation towhat is established for a presential assessment. Nor would it be necessary to make any changes in the type of tests .

Therefore, the assessment criteria are maintained, adapting the tests, if necessary and as indicated in the Rector's Resolution, to the telematic resources made available to the teaching staff

IDENTIFYING DATA				
Resistance of materials				
Subject	Resistance of materials			
Code	V12G380V01402			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Caamaño Martínez, José Carlos Riveiro Rodríguez, Belén			
Lecturers	Caamaño Martínez, José Carlos Cabaleiro Núñez, Manuel Caride Tesouro, Luís Miguel Fuentes Fernández, Eugenio Ignacio Lorenzo Mateo, Jaime Alberto Pereira Conde, Manuel Riveiro Rodríguez, Belén			
E-mail	jccaam@uvigo.es belenriveiro@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	Introduction to linear elastic materials, and analysis of internal loadings, stress and strain relationships. Study of the fundamentals of mechanics of materials and particularization for shafts and beam structures.			

Competencies	
Code	
CG3	CG3 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.
CG4	CG4 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.
CE14	CE14 Knowledge and use of the principles of strength of materials.
CT1	CT1 Analysis and synthesis
CT2	CT2 Problems resolution.
CT9	CT9 Apply knowledge.
CT10	CT10 Self learning and work.
CT16	CT16 Critical thinking.
CT17	CT17 Working as a team.

Learning outcomes	Competences		
To know the differences between rigid solid and elastic solid. To know the stress and deformation states in a deformable solid and the relationship between them. Apply the acquired knowledge to the determination of the maximum values of stress at a point of a deformable solid. T know the basic principles governing the Mechanics of Materials. To know the relationships between the different stress resultants and the stresses. To apply the knowledge acquired to the determination of stress resultant diagrams. To apply the acquired knowledge about stresses applied to bar elements. To know the basics about deformations of bar elements. To apply the knowledge acquired to the dimensioning of bar elements.	CG3 CG4	CE14	CT1 CT2 CT9 CT10 CT16 CT17

Contents	
Topic	
1. Introduction	1.1 Introduction 1.2 Review of statics fundamentals and applied concepts for further progress in solid mechanics and stress analysis

2. Basic principles of elasticity and mechanics of materials.	2.0 Stress and strain. Linear elastic materials 2.1. Normal stress in an axially loaded prismatic bar. 2.2. Equilibrium of a deformable body. 2.3. Stress-Strain diagram of ductile materials. Hooke's Law. 2.4. Stress resultants. Diagrams.
3. Axial loads	3.1. Normal forces. 3.2. Elastic deformation of an axially loaded member. 3.3. Statically governed problems. 3.4. Statically indeterminate problems. 3.5. Thermal stress and assembly misfits.
4. Bending	4.1 Beams: definition and types. Loads on beams. 4.2 Internal shear forces and bending moments. 4.3 External load, shear force and bending moment relationships. 4.4 Shear and moment diagrams 4.5 Pure bending and non-uniform bending. Hypothesis and limitations. 4.6. Normal stresses in unsymmetric bending. 4.7 Symmetric bending. The flexure formula (Navier's Law). 4.8 Section modulus of a beam. Ideal beam cross-section. 4.9 Deflection of beams and shafts. Slope and deflection. Mohr's Theorems. 4.10 Hyperstatic bending.
5. Other forces: shear, buckling and torsion	5.1. Shear in joints. Definition. Shear force. Shear stress. Bolted and riveted joints. Shear joints. 5.2. Introduction to the concept of compressive buckling. 5.3. Intoduction to the concept of torsion in straight prisms.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	32.5	49	81.5
Laboratory practical	9	23	32
Project based learning	9	24.5	33.5
Essay questions exam	3	0	3

*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 where theoretical principles are presented using digital media, videos and blackboard.
Laboratory practical	Activities of application of the knowledge to concrete situations and of acquisition of basic skills and procedural skills related with the subject of study.
Project based learning	Resolution of problems related to real case studies.

Personalized assistance

Methodologies	Description
Laboratory practical	The students can ask the lecturers for the clarification of those concepts presented in the lecturers and practicals, as well as to clarify / discuss any doubts that may appear after the end of the sessions. The tutoring sessions may be carried out by telematic means (Remote Campus, Faitic, etc.) under the modality of prior agreement.

Assessment

	Description	Qualification	Evaluated Competencess		
Laboratory practical	A) it will evaluate the attendance and active participation in all the practicals of the semester, as well as the correct delivery (time and form) of all the documentation requested (reports, exercises, etc.). Practical sessions will be held in a fixed date, so it is not possible to attend the practical in a later date. Whether the student does not attend to a practical, he/she must demonstrate that the absence was due to unavoidable reasons (e.g. medical reasons). Practicals will marked with the value indicated, only when the student reaches the minimum mark in the written exam, which is 45%. (See following section: 'Other comments')	2.5	CG3 CG4	CE14	CT1 CT2 CT9 CT10 CT16 CT17

Project based learning	C) Written tests to evaluate the individual work delivered by the student. It will be compulsory the attendance to the 90% of the practicals to obtain the marks given in section C. The marks obtained in the sections A will proportionally affect to the marks of the section C. The section C will be marked with a maximum value of 12,5% of the total mark, only when the student reach the minimum mark in the written exam, which is 45%. (See following section: 'Other comments')	12.5	CG3 CG4	CE14	CT1 CT2 CT9 CT10 CT16
Essay questions exam	Written exam in the dates established by the School.	85	CG3 CG4	CE14	CT1 CT2 CT9 CT10 CT16

Other comments on the Evaluation

Students resigning continuum assessment (after School aproval) will be evaluated only through the written exam which will be graded with 100% of final mark.

Continuum assessment is composed of sections A and C. The maximum mark for continuum assessment (NEC) is 15%, which will be computed from the following equation: NEC (%) = 0,25·(A) + 1,25·(C)·(A) ; where A and C are granted 0-1.

Ethical commitment: it is expected an adequate ethical behavior of the student. In case of detecting unethical behaviour (copying, plagiarism, unauthorized use of electronic devices, etc.) shall be deemed that the student does not meet the requirements for passing the subject.

In this case, the overall rating in the current academic year will be Fail (0.0).

The use of any electronic device for the assessment tests is not allowed unless explicitly authorized. The fact of introducing unauthorized electronic device in the examination room will be considered reason for not passing the subject in the current academic year and will hold overall rating (0.0).

Sources of information

Basic Bibliography

Hibbeler, R., **Mechanics of Materials**,

Manuel Vázquez, **Resistencia de materiales**,

Complementary Bibliography

Ortiz Berrocal, L., **Resistencia de materiales**, Ed. McGraw-Hill,

González Taboada, J.A., **Tensiones y deformaciones en materiales elásticos**, Ed. Autor,

González Taboada, J.A., **Fundamentos y problemas de tensiones y deformaciones en materiales elásticos**, Ed. Autor,

Recommendations

Other comments

Requirements: To register for this module the student must have passed or be registered for all the modules of the previous year.

Contingency plan

Description

=== ADAPTATION OF THE ASSESSMENT ===
* Teaching methodologies that do not change
All the methodologies keep being the same as they can be held using the Campus Remoto platform complemented with faitic:
- Lecturing
- Project based learning
- Laboratory practical (only if mix teaching is adopted)

* Teaching methodologies to be modified
- "Laboratory practical" will be substituted by "Systematic observation", which will be measured by carrying out experiments or reports that the students can carry out from their homes. The periodicity would be weekly and of temporary dedication equivalent to the laboratory practices.

* Non-attendance mechanisms for students personal attention (tutoring)
The tutoring will be carried out by email to the teacher of the subject, who will be able to solve the doubts by email, or invite the student to participate in a tutorial through the remote teaching tools, Remote Campus, Teams, etc.).

* Changes in the contents (if applicable)
No modification in the contents is envisaged.

* Additional bibliography
Detailed notes will be provided to complement the material presented in the classes taught through the Remote Campus.

* Other

=== ADAPTACIÓN DE LA EVALUACIÓN ===
* Tests that are modified
[Laboratory practical] => [Systematic observation] [5%]
(this correspond to mark "A", in the formula for continuos assessment)

[Project based learning]=> [Resolution of exercises] [10%]
(this correspond to mark "C", in the formula for continuos assessment)

The Continuous Assessment Mark (NAC), will be calculated as follows: NAC = (0'5·A) + 1,0 (C)·A; where A y C: 0-1.

[Essay question exam] => [Essay question exam] [50%]

* New Tests
[objective questions exam][35%]
Throughout the course, questionnaires will be carried out for the subjects previously taught, so that the subject can be monitored using telematic means.

* Additional information

IDENTIFYING DATA				
Fundamentals of automation				
Subject	Fundamentals of automation			
Code	V12G380V01403			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language	Spanish English			
Department				
Coordinator	Espada Seoane, Angel Manuel López Fernández, Joaquín			
Lecturers	Espada Seoane, Angel Manuel Fernández Silva, María López Fernández, Joaquín Rajoy González, José Antonio			
E-mail	joaquin@uvigo.es aespada@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	In this matter present the basic concepts of the systems of industrial automation and of the methods of control, considering like central elements of the same the programmable programmable logic controller and the industrial controller, respectively.			

Competencies	
Code	
CG3	CG3 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.
CE12	CE12 Know the fundamentals of automation and control methods.
CT2	CT2 Problems resolution.
CT3	CT3 Oral and written proficiency.
CT6	CT6 Application of computer science in the field of study.
CT9	CT9 Apply knowledge.
CT16	CT16 Critical thinking.
CT17	CT17 Working as a team.
CT20	CT20 Ability to communicate with people not expert in the field.

Learning outcomes	Competences		
Purchase a global and realistic vision of the current scope of industrial automation systems.	CG3	CE12	CT17 CT20
Know which are the constitutive elements of an industrial automation system, its sizing and as they work.	CG3	CE12	CT2 CT6 CT20
Knowledge applied on the programmable logic controllers, its programming and its application to industrial automation systems.	CG3	CE12	CT2 CT6 CT9 CT16 CT17
General knowledge on the continuous control of dynamic systems, of the main tools of simulation of continuous systems and of the main devices of process control with greater interest to industrial level.	CG3	CE12	CT3 CT6 CT17 CT20
General concepts of the technicians of industrial controllers tuning.	CG3	CE12	CT2 CT9 CT16

Contents
Topic

1. Introducción to industrial automation and elements of automation.	1.1 Introducción to automation of tasks. 1.2 Types of control. 1.3 The programmable logic controller. 1.4 Diagrama of blocks. Elements of the PLC. 1.5 Cycle of operation of the PLC. Time of cycle. 1.6 Ways of operation.
2. Languages and programming technics of programmable logic controllers.	2.1 Binary, octal, hexadecimal, BCD systems. Real numbers. 2.2 Access and adressing to periphery. 2.3 Instructions, variables and operating. 2.4 Forms of representation of a program. 2.5 Types of modules of program. 2.6 linear Programming and estructurada. 2.7 Variables binarias. Entrances, exits and memory. 2.8 Binary combinations. 2.9 Operations of allocation. 2.10 Timers and counters. 2.11 Operations aritméticas.
3. Tools for sequential systems modelling.	3.1 Basic principles. Modelling technics. 3.2 Modelling by means of Petri Networks. 3.2.1 Definition of stages and transitions. Rules of evolution. 3.2.2 Conditional election between several alternatives. 3.2.3 Simultaneous sequences. Concurrence. Resource shared. 3.3 Implementation of Petri Networks. 3.3.1 Direct implementation. 3.3.2 Normalised implementation (Grafcet). 3.4 Examples.
4. Control systems introduction.	4.1 Systems of regulation in open loop and closed loop. 4.2 Control typical loop. Nomenclature and definitions.
5. Representation, modelling and simulation of continuous dynamic systems.	5.1 Physical systems and mathematical models. 5.2.1 Mechanical systems. 5.2.2 Electrical systems. 5.2.3 Others. 5.3 Modelling in state space. 5.4 Modelling in transfer function. Laplace transform. Properties. Examples. 5.5 Blocks diagrams.
6. Analysis of continous dynamical systems.	6.1 Stability. 6.2 Transient response. 6.2.1 First order systems. Differential equation and transfer function. Examples. 6.2.2 Second order systems. Differential equation and transfer function. Examples. 6.2.3 Effect of the addition of poles and zeros. 6.3 Systems reduction. 6.4 Steady-state response. 6.4.1 Steady-state errors. 6.4.2 Input signals and system type. 6.4.3 Error constants.
7. PID controller. Parameters tunning of industrial controllers.	7.1 Basic control actions. Proportional effects, integral and derivative. 7.2 PID controller. 7.3 Empirical methods of tuning of industrial controllers. 7.3.1 Open loop tuning: Ziegler-Nichols and others. 7.3.2 Closed loop tuning: Ziegler-Nichols and others. 7.4 Controllers design state space. Pole assigment.
P1. Introduction to STEP7.	Introduction to the program STEP7, that allows to create and modify programs for the Siemens PLC S7-300 and S7-400.
P2. Programming in STEP7.	Modelling of simple automation system and implementation in STEP7 using binary operations.
P3. Implementation of PN in STEP7.	Petri Networks modelling of simple automation system and introduction to the implementation of the same in STEP7.
P4. PN Modelling and implementation in STEP7.	Petri Networks modelling of complex automation system and implementation of the same in STEP7.
P5. GRAFCET modelling and implementation with S7-Graph.	Petri Networks normalised modelling and implementation with S7-Graph.
P6. Control systems analysis with MATLAB.	Introduction to the control systems instructions of the program MATLAB.
P7. Introduction to SIMULINK.	Introduction to SIMULINK program, an extension of MATLAB for dynamic systems simulation.

P8. Modelling and transient response in SIMULINK.	Modelling and simulation of control systems with SIMULINK.
P9. Empirical tuning of an industrial controller.	Parameters tuning of a PID controller by the methods studied and implementation of the control calculated in an industrial controller.

Planning			
	Class hours	Hours outside the classroom	Total hours
Laboratory practical	18	30	48
Problem solving	0	15	15
Lecturing	32.5	32.5	65
Essay questions exam	3	19	22

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

Methodologies	
	Description
Laboratory practical	Different activities aimed to apply the concepts learned during the lectures.
Problem solving	The professor is going to solve in class some problems and exercises. The students need to solve similar exercises on their own to obtain the capabilities needed.
Lecturing	Include the professor lectures about the contents of the subject.

Personalized assistance

Methodologies	**Description**
Lecturing	For a effective use of the dedication of the student body, the faculty will attend personally the doubts and queries of the same. Said attention will take place so much in the classes of theory, problems and laboratory as in the tutorials (in a schedule prefixed). For all teaching modalities, the tutoring sessions may be carried out by telematic means (email, videoconference, FAITIC forums, ...) under the modality of prior agreement.
Laboratory practical	For a effective use of the dedication of the student body, the faculty will attend personally the doubts and queries of the same. Said attention will take place so much in the classes of theory, problems and laboratory as in the tutorials (in a schedule prefixed). For all teaching modalities, the tutoring sessions may be carried out by telematic means (email, videoconference, FAITIC forums, ...) under the modality of prior agreement.
Problem solving	For a effective use of the dedication of the student body, the faculty will attend personally the doubts and queries of the same. Said attention will take place so much in the classes of theory, problems and laboratory as in the tutorials (in a schedule prefixed). For all teaching modalities, the tutoring sessions may be carried out by telematic means (email, videoconference, FAITIC forums, ...) under the modality of prior agreement.
Tests	**Description**
Essay questions exam	For a effective use of the dedication of the student body, the faculty will attend personally the doubts and queries of the same. Said attention will take place so much in the classes of theory, problems and laboratory as in the tutorials (in a schedule prefixed). For all teaching modalities, the tutoring sessions may be carried out by telematic means (email, videoconference, FAITIC forums, ...) under the modality of prior agreement.

Assessment

	Description	Qualification	Evaluated Competencess		
Laboratory practical	It will evaluate each practice of laboratory between 0 and 10 points, in function of the fulfillment of the aims fixed in the billed of the same and of the previous preparation and the attitude of the students. Each practical will be able to have distinct weight in the total note.	20	CG3	CE12	CT3 CT6 CT9 CT16 CT17 CT20
Essay questions exam	Final examination of the contents of the matter, that will be able to include problems and exercises, with a punctuation between 0 and 10 points.	80	CG3	CE12	CT2 CT3 CT16

Other comments on the Evaluation

- Continous Assesment of student work practices along established laboratory sessions will be held in the semester, with the assistance to them mandatory. In the case of not overcome, a review of practices, conditioned to having passed the script test, will take place in the second call, on a date after the script test, in one or more sessions and including the contents not passed in ordinary practice sessions.

- The assesment of the practices for students who officially renounces Continuous Assesment will be carried out in a review of practices, conditioned to having passed the script test, in the two calls, on a date after the script test, in one or more sessions and including the same contents of the ordinary practice sessions..
- It may demand previous requirements to the realisation of each practice in the laboratory, so that they limit the maximum qualification to obtain.
- It must pass both tests (script and practices) to pass the matter, give the total score at the rate indicated above. In case of no longer than two or one test, scaling may be applied to partial notes that the total does not exceed 4.5.
- In the final exam may establish a minimum score on a set of issues to overcome.
- In the second call of the the same course, students should examine the tests (script and/or practices) not passed in the first one, with the same criteria of that.
- According to the Rule of Continuous Assesment, the subject students to Continuous Assesment that present to some activity evaluable collected in the Teaching Guide of the matter, will be considered like "presented".
- Ethical commitment: student is expected to present an adequate ethical behavior. If you detect unethical behavior (copying, plagiarism, unauthorized use of electronic devices, and another ones), it follows that the student does not meet the requirements for passing the subject. In this case the global qualification in the present academic course will be of suspense (0.0).

Sources of information

Basic Bibliography

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MANUEL SILVA, **Las Redes de Petri en la Automática y la Informática**, 1ª, AC, 1985

R. C. DORF, R. H. BISHOP, **Sistemas de Control Moderno**, 10ª, Prentice Hall, 2005

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PORRAS A., MONTANERO A., **Autómatas programables : fundamento, manejo, instalación y prácticas**, McGraw-Hill, 2003

ROMERA J.P., LORITE J.A., MONTORO S., **Automatización : problemas resueltos con autómatas programables**, 4ª, Paraninfo, 2002

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OGATA, KATSUIKO, **Ingeniería de Control Moderna**, 5ª, Pearson, 2010

Recommendations

Subjects that continue the syllabus

Product design and communication, and automation of plant elements/V12G380V01931

Subjects that are recommended to be taken simultaneously

Electronic technology/V12G380V01404

Subjects that it is recommended to have taken before

Computer science: Computing for engineering/V12G380V01203
Mathematics: Calculus II and differential equations/V12G380V01204
Fundamentals of electrical engineering/V12G380V01303

Other comments

- Requirements: To enrol in this subject is necessary to had surpassed or well be enrolled of all the subjects of the inferior courses to the course in the that is summoned this subject.

Contingency plan

Description

Considering the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University establishes an extraordinary planning that will be activated when the administrations and the institution determine it. It is based on safety, health and responsibility, and it guarantees teaching in an online or semi-presential modalities. These already planned measures will guarantee, at the required time, the development of teaching in a more agile and effective way, because they will be known in advance by students and teachers through the standardized tool for teaching guides DOCNET

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching Methodologies that keep

- Lecturing.
- Problem solving.

- Laboratory practices without use of instrumentation.

* Teaching methodologies that modify

- Laboratory practices with use of instrumentation: will be replaced by activities in virtualized environments.

* Adaptation of tutorial sessions and personalized attention

The tutorial sessions may be carried out by telematic means (email, videoconference, FAITIC forums, ...) with prior agreement.

=== ADAPTATION OF THE EVALUATION ===

Keep the type of proofs and his weighting in the final qualification, adapting his realization to the circumstances.

IDENTIFYING DATA				
Electronic technology				
Subject	Electronic technology			
Code	V12G380V01404			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language	Spanish Galician English			
Department				
Coordinator	Nogueiras Meléndez, Andres Augusto			
Lecturers	Domínguez Gómez, Miguel Ángel Nogueiras Meléndez, Andres Augusto Pérez López, Serafín Alfonso Verdugo Mates, Rafael			
E-mail	aaugusto@uvigo.gal			
Web	http://moovi.uvigo.gal/			
General description	The objective of this course is to provide the students with the theoretical and practical fundamental knowledge in electronics' five main areas: analog electronics, digital electronics, industrial sensors, power electronics and communications electronics. In case of any discrepancy between this translation of the guide and the Spanish version, the valid one is the Spanish version.			

Competencies	
Code	
CG3	CG3 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.
CE11	CE11 Knowledge of the fundamentals of electronics.
CT2	CT2 Problems resolution.
CT9	CT9 Apply knowledge.
CT10	CT10 Self learning and work.
CT17	CT17 Working as a team.

Learning outcomes	Competences			
Know the operation of the electronic devices.	CB2 CB4	CG1 CG3 CG13	CE11 CE12 CE20	CT2 CT2 CT3 CT4 CT5 CT6 CT9 CT10 CT10 CT12 CT15 CT17
Know the electronic systems of conditioning and acquisition of data.	CB2 CB4	CG1 CG13	CE11 CE12 CE20	CT2 CT3 CT4 CT5 CT6 CT10 CT10 CT12 CT15
Identify the different types of industrial sensors.				CT10
Know the digital electronic systems basic.			CE11	CT2 CT9 CT17

Know the electronic circuits for the communication of information.	CG1 CG3 CG3 CG10	CE16	CT10

Contents	
Topic	
Introduction	- Control and supervision of industrial systems by means of electronics - Some representative cases
Electronic devices, circuits and systems	- Electronics components and devices - Active and passive electronic devices - Analog and digital electronic circuits - Electronic systems
Diodes and rectification	- The diode - Operation modes and characteristics - Diodes types - Operation Models - Analysis of circuits with diodes - Rectifier circuits - Filtering for rectifier circuits - Thyristors
Transistors	- The Bipolar Junction Transistor (BJT.) Operation principles and characteristic curves - Work zones - Quiescent point design - The transistor operating as a switch - The transistor operating as an amplifier - Field Effect Transistors (FET).
Amplification	- Amplification concept - Feedback concept - The Operational Amplifier (OA) - Basic circuits with OA - The Instrumentation Amplifier
Digital Electronics I	- Numbering Systems - Boolean Algebra - Combinatorial logic functions. Analysis, synthesis and reduction
Digital electronics II	- Flip-flops - Sequential logic circuits - Programmable Systems - Microprocessors - Memories
Electronic Sensors	- Sensors - Types of sensors as function of the measuring magnitude - Some sensors of special interest in industry applications - Electrical model of some common sensors - Study of some examples of coupling sensors and CAD system
Analog - Digital Converters	- The Analog and Digital Signals. - The Analog to Digital Converter (ADC) - Sampling, quantification and digitization - More important ADC characteristics: number of bits, sampling speed, conversion range and cost
Industrial Communications	- Introduction to Industrial Communications - Industrial data buses.
Power Electronics	- Circuits for Power Conversion - Rectifiers - Lineal and Switched Power Sources

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	25	0	25
Problem solving	8	0	8
Previous studies	0	49	49
Autonomous problem solving	0	46	46
Laboratory practical	18	0	18
Objective questions exam	1	0	1
Essay questions exam	3	0	3

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

Methodologies	
	Description
Lecturing	These sessions will be held in the rooms and dates fixed by the direction of the school. They will consist in an oral explanation by the professor of the most important parts of the course, all related with the materials that the student had to work previously. This is intended to favor the active participation of the students, that will have occasion to rise doubts and questions during the sessions. Active participation is desired during all the sessions.
Problem solving	During these sessions, in the classroom, interleaved with the lectures, the professor will proceed to solve examples and/or exercises that properly illustrate the problems to solve. As long as the number of participants in the classroom allows, active participation will be promoted.
Previous studies	Previous preparation of the theoretical sessions: Prior to the start of the theoretical sessions, the students will have available a series of materials that have to prepare, as the sessions will relay on them. Previous preparation of the laboratory sessions: It is mandatory that the students make all the assigned previous tasks prior to access the laboratory. These task are intended to greatly improve the laboratory knowledge acquisition. The achieved report will be taken into account when the laboratory session is to be evaluated.
Autonomous problem solving	Self study and review of the theoretical sessions for knowledge consolidation: The student must study, in a systematic time schedule, after each lecture session, in order to dissipate any doubts. Any doubts or unsolved questions will have to be expose to the professor as soon as possible in order to enhance the feedback of the learning process.
Laboratory practical	Laboratory sessions will be held in the time schedule established by the school's head teacher. Students will work in groups of two students each. The sessions will be supervised by a professor, who will control the assistance and will also evaluate the harnessing of it. During the laboratory sessionsthe students will make activities of the following kinds: - Assembling electronics circuits - Use of electronic instrumentation - Measure of physical variables on circuits - Do calculations related to the circuit and/or the measurements - Collect data and represent it (diagrams, charts, tables) At the end of each laboratory session each group will deliver the corresponding score sheets.

Personalized assistance	
Methodologies	**Description**
Laboratory practical	Tutoring Sessions: During the established schedule of each professor, students will be able to speak freely about course issues with the professor. Also the will receive orientation and academic support, if needed. Email: The students also will be able to request orientation and support by means of email to the professors of the course. This way of attention is advisable for indications and short doubts of punctual type.

Assessment					
	Description	Qualification	Evaluated Competencess		
Laboratory practical	Assessment of the laboratory sessions: The laboratory sessions will be evaluated in a continuous way, on each session. The applied criteria are: - A minimum attendance of 80% - Punctuality - Previous task preparation of the sessions - Make the most of the session The practical sessions will be held in groups of two students. The documents of the practices will be available prior to the sessions. The students will fill report, that will be delivered when the session ends. This report serves to justify both the attendance and how they have done the work asked for.	20		CE11	CT9 CT10 CT17
Objective questions exam	These partial tests evaluate part of the theoretical content of the subject. They will consist of individual objective tests related to a set of topics of the subject.	80	CG3	CE11	CT2 CT9 CT10

Essay questions exam	It will consist of an objective individual test where the entire content of the subject will be evaluated. It will be held at the end of the semester at the times established by the center's management.	80	CG3	CE11	CT2 CT9 CT10

Other comments on the Evaluation

EVALUATION AND GRADING OF THE SUBJECT

The evaluation of the subject is continuousand consists of the following elements:

Self assessment :

Associated with each topic there are severalself-assessment questionnaires. There are short questionnaires after each section or pill into which each topic is divided, and a larger and more comprehensive questionnaire at the end of each topic. These self-assessment questionnaires have no influence on the grade. The purpose of these questionnaires is to help students assess their level of knowledge about each of the topics. The answers of these questionnaires by the students provide valuable information to the teaching staff about those aspects of the subject in which the students find greater difficulties.

Laboratory sessions:

The evaluation of the laboratory sessions accounts for 20% of the course grade. The laboratory sessions are evaluated one by one, obtaining a grade for each session. The evaluation criteria are: attendance, punctuality, prior preparation and performance. The laboratory session grade (NP) will be obtained by averaging the grades of all the sessions, with the following requisites:

- A minimum attendance of 80% must be recorded, otherwise the laboratory grade will be zero.
- A minimum of 3.3 points in the grade of theory must be reached (NT), otherwise the laboratory grade will be zero.

Theory:

The evaluation of the theory part (NT) accounts for 80% of the course grade. For its evaluation, the subject will be divided into two parts (P1 and P2), each covering approximately 50% of the contents of the subject and three evaluation sessions will be held, distribute das follows:

First session: It will take place approximately in the middle of the semester. This session will exclusively evaluate P1.

Second session: It will be held on the date and time established by the center for the final exam in May. In this session each student will be able to take advantage of one of the following options:

- Incomplete option: Only P2 is examined. Students who have obtained a grade equal to or greater than 3.3 points in P1 may choose this option. If the grade obtained in P2 is equal to or greater than 3.3 points, the resulting grade will be NT = (P1 + P2) / 2. If the grade obtained in P2 is less than 3.3 points, NT will be calculated in the same way, but its maximum value will be limited to 3.6 points.
- Complete option: The student renounces the grade of P1 obtained in the first session and takes a complete exam (EC) of the entire theory. The grade will be NT = EC.

Third session: It will be done on the date and time established by the center for the final exam in July. In this session, the students will take a complete exam (EC). The grade will be NT = EC.

The final grade (NA) will be calculated asfollows: NA = 0.2x (NL) + 0.8x (NT)

Other considerations

For the present academic year, the laboratory qualifications of the two previous years will be kept and considered valid.

Those students to whom the management of thecenter grants the waiver of continuous evaluation will be evaluated, on the same day and time of the final exam established by the center (second and / or third session). The evaluation will consist of two tests: An exam in full modality (EC) with a weight of 80% on the final grade. A specific laboratory test, weighing 20% on the final grade. In principle, this specific test will be carried out after the written test in the electronic laboratories of the corresponding center's site.

In the extraordinary call End of Degre estudents will take a theory exam that will have a weight of 80% on the final grade. The remaining 20% will be obtained from the qualification of aspecific laboratory test.

To pass the course, in any of the previous cases, it is necessary to achieve a final grade equal or higher than 5 points.

Recommendations:

It is very important that the students keep updated the profile in the FAITIC platform. All communications related with this course will be made through this platform. All individual communications will be made through the email listed in this platform.

The students can solve doubts related with the laboratory previous activities in the personal attention hours (tutoring time), or by any other contact procedure available in FAITIC.

The students must meet the deadlines for all the activities.

All the achieved results must be justified, in any of the exams or activities. None of the achieved results will be taken for good if no explanation is given about the method used to find them. The selected method for solving a problem is considered when grading the solution.

When writing the solutions and answers in reports and tests, avoid spelling mistakes and unreadable symbols.

Exams lacking some of the sheets will not be graded.

Use of cell phones, notes or books is forbidden during exams.

Competencies Acquisition and Its Influence on Assesments

In this subject all the different activitiesare designed to assess the students in the competencies, and the acquisition ofthe competencies defines the final mark. Here follows a description of how thecompetencies and activities are related.
CG3 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.
The acquisition of this competency is providedby the contents of the topics of the subject. All activities ofself-assessment, the laboratory sessions and the different test are elaborated to evaluate the knowledge of the technical subjects.
CE11 Knowledge of the fundamentals ofelectronics.
This competency is warrant to be acquired along all the lectures, the laboratory sessions, the self-assessment activities andt he tests.
CT2 Problems resolution.
The students will exercise this competency by means of the following activities: self-assessment activities, bulletin of problems and previous theoretical solution of experiments to be made at the laboratory. This competency is also acquired along all thetest (for each block and the individual one), as they mainly are composed by problems to be solved.
CT9 Apply Knowledge
This competency is mainly acquired during the laboratory sessions, where the theoretical knowledge from problems, designs and simulations should match the assembly of circuits and real measures. Laboratory sessions are evaluated one by one, scoring an average of marks, if there is a minimum number of attended sessions with a minimum score.
CT10 Self learning and work
The self learning process is fundamental to achieve the score to approve the subject. In order to motivate students in the task of acquiring the theoretical knowledgeneed, self-assessment test (on line), lectures based on the remote learningplatform (faitic) and bulletins of problems have been created. Theself-assessment test also provide feedback to the professors about the main difficulties found by students. On thelaboratory sessions, the previous preparation is an explicit method of evaluation. In order to made this preparation, each of the laboratory sessions has its specific documentation and tutorials.
CT17 Working as a team
The students exercise this competency at the laboratory sessions, by making teamsof two people. Cooperation in most of the sessions is needed to perform the assembly of circuits, make the measurements and take notes. The professor in charge of the laboratory session verifies the previous work and how each session is going along, watching that both members cooperate to achieve the best possible result. Scores for students can be different if the professor detects that one of the team member is not cooperating.

Sources of information
Basic Bibliography
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Pleite Guerra, J.; Vergaz Benito, R.; Ruíz de Marcos; J. M., **Electrónica analógica para ingenieros.**,

Recommendations

Subjects that are recommended to be taken simultaneously

Fundamentals of automation/V12G380V01403

Subjects that it is recommended to have taken before

Physics: Physics I/V12G380V01102
Physics: Physics II/V12G380V01202
Mathematics: Algebra and statistics/V12G380V01103
Mathematics: Calculus I/V12G380V01104
Mathematics: Calculus II and differential equations/V12G380V01204
Fundamentals of electrical engineering/V12G380V01303

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 ===

An attempt will be made to ensure that the degree of attendance in teaching activities is the maximum that guarantees the safety and health of all parties involved. In any case, the guidelines will be followed in instructions indicated by the management of the center.
In the event that there is a situation in which the teaching activities cannot be attended, neither the content nor the learning results contemplated in the subject will be affected. To this end, the following adaptations will be made.

Theory sessions:

In the event that they cannot be attended, remote classrooms or any other means enabled by the university will be used for their delivery. The contents taught will be the same.

Laboratory sessions:

In the event that they cannot be attended, remote classrooms or any other means enabled by the university will be used for their delivery. In those situations where the sessions are not face-to-face, simulation tools will be preferably used.

Tutorials:

For the situation of non-attendance, email and, if necessary, telephone or videoconference will be used preferably.

Evaluation:

In the event that the tests cannot be carried out in person, they will be carried out by telematic means. The number of assessment tests will not change, nor will the relative weight of each one of them in the grade of the course.

IDENTIFYING DATA				
Fluid mechanics				
Subject	Fluid mechanics			
Code	V12G380V01405			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language				
Department				
Coordinator	López Veloso, Marcos			
Lecturers	Gil Pereira, Christian López Veloso, Marcos Molares Rodríguez, Alejandro Paz Penín, María Concepción Román Espiñeira, Ignacio Javier			
E-mail	marcoslpzveloso@uvigo.es			
Web				
General description	This syllabus presents information about the Fluid mechanics course during the 2nd year of the degree in Mechanical Engineering, 2019-2020, in accordance to the guidelines by the European Space of Upper Education. This is a first course in fluid mechanics, focusing on the topics that are relevant to Mechanical Engineering applications. The course is intended to acquire essential knowledge needed to analyze devices with fluid as a working material, such us hydraulic machinery, lubrication devices, heating and cooling systems, pipes systems, pneumatic systems, aero and hydrodynamics devices, windturbines, etc. It includes stress and strain rate descriptions, fluid statics, use of differential and finite control volume analysis with continuity, momentum, and energy equations, Bernoulli and Euler equations, incompressible viscous flow using Navier-Stokes equations, dimensional analysis, laminar and turbulent pipe flow.			

Competencies	
Code	
CG4	CG4 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.
CG5	CG5 Knowledge to carry out measurements, calculations, assessments, appraisals, surveys, studies, reports, work plans and other similar works.
CE8	CE8 Knowledge of the basic principles of fluid mechanics and their application to solving problems in the field of engineering. Calculation of pipes, channels and fluid systems.
CT2	CT2 Problems resolution.
CT9	CT9 Apply knowledge.
CT10	CT10 Self learning and work.

Learning outcomes			
Learning outcomes	Competences		
CG5 Knowledge for the realisation of measurements, calculations, assessments, evaluations, studies, reports, plans of works and other analogous works.	CG4 CG5	CE8	CT2 CT9 CT10
CG4 Capacity to: solve problems with initiative and creativity, take decisions, develope critical reasoning and capacity to communicate and transmit knowledge and skills in the field of the industrial engineering.	CG4 CG5	CE8	CT2 CT9 CT10
RI2 Knowledge of the basic principles of the fluid mechanics and his application to the resolution of problems in the field of the engineering. Intended learning outcomes are, understanding of the basics of flow behaviour in engineering systems, awareness of the physical laws that govern fluid motion and development of analytical skills for simple flow systems, e.g. calculation of pipes, channels and fluid systems	CG4 CG5	CE8	CT2 CT9 CT10
CT2 Resolution of problems.	CG4 CG5	CE8	CT2 CT9 CT10

Contents
Topic

1. Introduction	1.1 Fundamental Concepts: 1.1.1 Stress tensor. Newton Law 1.2 The Fluid as a Continuum 1.3 Viscosity:1.3.1 Newtonian Fluids and non Newtonian fluids 1.4 Characteristics of the flows: 1.4.1 Different types of flows: 1.4.1.1 Geometrical conditions, 1.4.1.2 Kinematic conditions, 1.4.1.3 Mechanical conditions, 1.4.1.4 Compressibility 1.5 Stresses on a fluid: 1.5.1 Tensorial and vectorial magnitudes, 1.5.1.2 Volumetric Forces, 1.5.2.2 Surface Forces, 1.5.2.3 The stress tensor, 1.5.2.4 Concept of pressure
2. Basic Physical Laws of Fluid Mechanics	2.1 Velocity field 2.2 Streamlines and pathlines 2.3 Systems and Control volumes 2.4 Integrals extended to Fluid volumes. The Reynolds Transport Theorem 2.5 Conservation of Mass. Integral and Differential Equation 2.6 The Linear Momentum Equation. Integral and Differential Equation. 2.7 Navier-Poisson Law 2.8 The Energy Equation. Integral and Differential Equation. Frictionless Flow: The Bernoulli Equation
3. Dimensional Analysis. Similarity concepts	3.1 Introduction 3.2 The Pi Theorem 3.3 Applications 3.4 Fundamental Nondimensional Numbers in Fluid Mechanics: 3.4.1 Physical meaning of the nondimensional numbers 3.5 Similarity in Fluid dynamics: 3.5.1 Partial Similarity, 3.5.2 Scaling effect
4. Laminar viscous flow	4.1 Introduction 4.2. Fully developed flow: 4.2.1 Hagen-Poiseuille Flow, 4.2.2 Viscous flow in circular ducts, 4.2.3 Flow in Noncircular Ducts 4.3 Entrance region effect 4.4 Losses in Pipe Systems: 4.4.1 Friction coefficient 4.5 Stability of laminar flow
5. Turbulent Flow in ducts	5.1 Introduction 5.2 Pipe-head Loss in turbulent regime: 5.2.1 Nikuradse chart, 5.2.2 Moody chart, 5.2.3 Empirical Formulas for flow in circular ducts. Hydraulic diameter
6. Minor Losses in Pipe Systems	6.1 Introduction 6.2 Minor Losses: 6.2.1 Loss at the entrance of a pipe, 6.2.2 Loss at the exit of a pipe, 6.2.3 Loss at contractions, 6.2.4 Loss at expansions, 6.2.5 Loss at elbows, 6.2.6 Losses at bends, elbows, tees and valves
7. Pipe systems	7.1 Pipes in series 7.2 Pipes in parallel 7.3 The three-reservoir pipe junction problem 7.4 Pipings netwoks 7.5 Nonsteady effects in duct flows: 7.5.1 Emptying time of a tank, 7.5.2 Setting of the steady flow in a pipe, 7.5.3 Water hammer
8. Open-Channel Flow	8.1 Introduction 8.2 Uniform Flow: 8.2.1 Pipes used like channels 8.3 Non uniform flow: 8.3.1 The hydraulic jump, 8.3.2 Fast transitions, 8.3.3 Flow over a gate, 8.3.4 Flow under a gate, 8.3.5 Section of control
LABORATORY	1. Measurements of head and minor losses in a pipe system. Minor losses measuremens in a venturi device. Minor losses measurents in a holed-plate. Friction coefficients measurements. Losses in elbows, bends, tees and valves

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	32.5	60.5	93
Problem solving	14	33	47
Laboratory practical	4	0	4
Essay questions exam	3	0	3
Problem and/or exercise solving	3	0	3

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

Methodologies

	Description

Lecturing	They explain the foundations of each subject needed to solve practical problems. It includes mainly lectures baut can also includes: Readings bibliographic Review Solution of problems Conferences Oral Presentations
Problem solving	They will apply the concepts tackled in the lectures. It includes activities such as: Readings Seminars Solution of problems Team working Study of practical cases
Laboratory practical	Fundamentally, they will consist on activities of experimentation, although they also can include: Practical cases Simulation Solution of problems Team working

Personalized assistance

Methodologies	Description
Lecturing	Personalized attention will be given to the students during class (throughout the possible questions that could arise) and during the specific timetable of the teacher for tutorships. Updated information of the tutorships timetables will be given to the students
Laboratory practical	Personalized attention will be given to the students during class (throughout the possible questions that could arise) and during the specific timetable of the teacher for tutorships. Updated information of the tutorships timetables will be given to the students

Assessment

	Description	Qualification	Evaluated Competencess		
Essay questions exam	Written exam consisting of: theoretical questions practical questions resolution of exercises/problems short covering of a topic	80	CG4 CG5	CE8	CT2 CT9 CT10
Problem and/or exercise solving	(*)Resolución de problemas e/ou exercicios propostos, que poderán incluír: - un número de entregas semanais (non presencial) - resolucións presenciais en horario de prácticas como reforzo de temas - Informe as actividades realizadas nas sesións de laboratorio, resultados da experimentación, etc.	20	CG4 CG5	CE8	CT2 CT9 CT10

Other comments on the Evaluation

Continuous evaluation: represents 20% of the grade. Except official renounce of the student, the course is followed under continuous assessment mode.

Continuous assessment grading is not saved year after year

Final exam: 80% of the total mark.

If the student does not attend the none of two final exams, the student will be graded as "non-attendance".

Summer final exam: the same criteria as in 1st call will be applied;
Ethical Commitment: In case of noticing a non ethical behaviour (copy, plagiarism, utilisation of unauthorised electronic devices, and others) it will be considered that the student does not gather the necessary requirements to pass the course. In this case, the global qualification iof the present academic course will be failed (0.0).

Sources of information

Basic Bibliography

Frank M White, **Mecánica de Fluidos/Fluid Mechanics**, VI,

Antonio Crespo, **Mecánica de fluidos**,

Complementary Bibliography

Philip M. Gerhart, Richard J Gross, , Jonh I. Hochstein, **FUNDAMENTOS DE MECANICA DE FLUIDOS**, II,
Yunus A. Çengel, John M. Cimbala, **Mecánica de fluidos : fundamentos y aplicaciones**,
Elena Martín Ortega, Concepción Paz Penín, **Prácticas de laboratorio de mecánica de fluidos**,
A. Liñán Martínez, M. Rodríguez Fernández, F.J. Higuera Antón, **Mecánica de fluidos**,
Victor L. Streeter, E. Benjamin Wylie, Keith W. Bedford, **Mecánica de fluidos/Fluid Mechanics**, IX,
Robert W. Fox, Alan T. McDonald, **Introducción a la mecánica de fluidos**,
Robert L. Mott, **Mecánica de fluidos**, VI,
Merle C. Potter, David C. Wiggert ; con Miki Hondzo, Tom I.P. Shih, **Mecánica de fluidos/Mechanics of Fluids**, III,
Pijush K. Kundu , Ira M. Cohen, **Fluid Mechanics**, 4th Edition,
G. M. Homsy et al., **Multi-media Fluid Mechanics**,

Recommendations

Subjects that are recommended to be taken simultaneously

Thermodynamics and heat transfer/V12G380V01302

Subjects that it is recommended to have taken before

Physics: Physics I/V12G380V01102
Physics: Physics II/V12G380V01202
Mathematics: Algebra and statistics/V12G380V01103
Mathematics: Calculus I/V12G380V01104
Mathematics: Calculus II and differential equations/V12G380V01204

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 ===
* Teaching methodologies maintained

* Teaching methodologies modified

* Non-attendance mechanisms for student attention (tutoring)

* Modifications (if applicable) of the contents

* Additional bibliography to facilitate self-learning

* Other modifications

=== ADAPTATION OF THE TESTS ===
* Tests already carried out
Test XX: [Previous Weight 00%] [Proposed Weight 00%]
...

* Pending tests that are maintained
Test XX: [Previous Weight 00%] [Proposed Weight 00%]
...

* Tests that are modified
[Previous test] => [New test]

* New tests

IDENTIFYING DATA				
Thermal engineering I				
Subject	Thermal engineering I			
Code	V12G380V01501			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	9	Mandatory	3rd	1st
Teaching language	Spanish			
Department				
Coordinator	Pazo Prieto, José Antonio Cerdeira Pérez, Fernando			
Lecturers	Cerdeira Pérez, Fernando Pazo Prieto, José Antonio			
E-mail	nano@uvigo.es jpazo@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	(*)Nesta materia preténdese que o alumno adquira os coñecementos esenciais que lle permitan comprender o funcionamento das máquinas térmicas e os procesos que teñen lugar no seu interior, así como que coñeza os tipos de máquinas e instalacións máis importantes e os seus compoñentes. O seu coñecemento resulta básico para a análise do funcionamento, deseño e construción das máquinas térmicas e dos equipos térmicos asociados ás mesmas, e en xeral as aplicacións industriais da enxeñería térmica.			

Competencies	
Code	
CG1	CG1 Skills for writing, signing and developing projects in the field of industrial engineering, whose purpose, specializing in Mechanics, construction, alteration, repair, maintenance, demolition, manufacturing, installation, assembly or operation of: structures, mechanical equipments, energy facilities, electrical systems and electronic installations and industrial plants, and manufacturing processes and automation.
CE21	CE21 Knowledge applied to thermal engineering.
CT1	CT1 Analysis and synthesis
CT2	CT2 Problems resolution.
CT6	CT6 Application of computer science in the field of study.
CT8	CT8 Decision making.
CT10	CT10 Self learning and work.
CT14	CT14 Creativity.
CT16	CT16 Critical thinking.
CT17	CT17 Working as a team.

Learning outcomes	Competences		
(*)	CG1	CE21	CT1 CT2 CT10
(*)	CG1	CE21	CT1 CT2 CT6 CT10 CT16 CT17
(*)		CE21	CT1 CT2 CT6 CT10 CT14 CT16

(*)	CG1	CE21	CT1 CT2 CT6 CT8 CT10 CT14 CT16 CT17
New	CG1	CE21	CT1 CT2 CT8 CT10 CT17

Contents	
Topic	
Installations of power with cycle of steam.	Introduction. Main components. Cycle Rankine. Thermal balance.
Installations of power with cycles of gas.	Introduction. Main components. Cycle Brayton. Thermal balance. Cycle Combined of gas-steam.
Pumping of heat.	Definitions. Cycle of Carnot reverse. Cycle of mechanical compression. Bomb of heat. Refrigeration by absorption. Refrigerants.
Study of the humid air.	Introduction. Variables psycrometrics. Diagrams psycrometric. Cooling tower.
Fuels employed in engines and thermal installations.	Classification. Properties.
Foundations of the combustion.	Introduction. Types of combustion.
Boilers and Burners.	Classification. Definitions. Types. Energetic balance.
Compressors.	Previous concepts. Reciprocating compressors. Rotary compressors.
Processes of spill.	Nozzles and diffusers.
Machines and thermal engines.	Classification. Basic concepts.
Engines of internal combustion.	Real cycles and theorists. Main components. Parameters characteristics. Characteristic curves. Auxiliary systems: refrigeration and lubrication.
Heat Exchangers.	Introduction. Classification Thermal balance. Distribution of temperature Analysis of exchangers - Method DTLM - Method NTU

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	38	50	88
Problem solving	20	40	60
Practices through ICT	4	4	8

Laboratory practical	10	10	20
Mentored work	0	15	15
Autonomous problem solving	0	25	25
Problem and/or exercise solving	3	0	3
Objective questions exam	2	4	6

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

Methodologies

	Description
Lecturing	Exhibition by part of the professor of the contents of the matter object of study.
Problem solving	Resolution of problems and/or exercises related with the subject that the student will make in classroom and/or laboratory. They will resolve problems of character "type" and/or practical examples.
Practices through ICT	Simulation of processes related with the content of the matter using specific software.
Laboratory practical	Experimentation of real processes in laboratory that complement the contents of the matter.
Mentored work	Activity directed to develop exercises or projects under the guidelines and supervision of the professor. His development can be linked with autonomous activities of the student, practices of laboratory,.... Activity in group or individual. The work developed can finally be exposed publicly in the classroom.
Autonomous problem solving	Resolution of problems and/or exercises related with the subject that the student will make out of the classroom.

Personalized assistance

Methodologies	Description
Autonomous problem solving	The students will be able to resolve the doubts of the matter and of the distinct bulletins of problems in the schedule of tutorials fixed by the professors of the matter.

Assessment

	Description	Qualification	Evaluated Competencess		
Problem and/or exercise solving	Examination (writing, oral,...) Consistent in the resolution of problems and/or of relative questions to the theory and/or to the practices of laboratory. It will allow to reach the maximum note (10 points).	60	CG1	CE21	CT1 CT2 CT8 CT10 CT14 CT16
Objective questions exam	During the development of the course, the students will have to make different questionnaires composed by theoretical objective questions and/or of resolution of exercises related with the contents developed.	40		CE21	CT1 CT2 CT6 CT8 CT10 CT14 CT16 CT17

Other comments on the Evaluation

Those students that make the tasks that commissions the educational along the course will be able to reach to the final examination with an income of points compensable purchased by continuous evaluation. The points reached will be valid in the two announcements of examination of the course. The final examination can be differentiated for the students that followed the continuous evaluation along the course concerning those that did not follow it. In both two cases the maximum note of the course will be of ten points. In the announcement End of Career the note may proceed of the evaluation of the examination in 100%, will not take into account the note of practices of the previous course.

Ethic Commitment: It is expected an adequate ethical behaviour of the student. In case of detecting unethical behaviour (copying, plagiarism, unauthorized use of electronic devices, etc.) shall be deemed that the student does not meet the requirements for passing the subject. In this case, the overall rating in the current academic year will be Fail (0.0).
The use of any electronic device for the assessment tests is not allowed unless explicitly authorized. The fact of introducing unauthorized electronic device in the examination room will be considered reason for not passing the subject in the current academic year and will hold overall rating (0.0).

Sources of information

Basic Bibliography

Agüera Soriano, José, **Termodinámica lógica y motores térmicos**, Ciencia 3, D.L.,
Moran M.J.; Shapiro H.N., **Fundamentos de termodinámica técnica**, Editorial reverté, S.A.,
Çengel Y.A.; Boles M.A., **Termodinámica**, McGraw-Hill-Interamericana,
Incropera, Frank P., **Fundamentos de transferencia de calor**, Prentice Hall,

Complementary Bibliography

Potter M.C.; Somerton C.W., **Termodinámica para ingenieros**, McGraw-Hill/Interamericana de España, D.L.,
Múñoz Domínguez, M.; Rovira de Antonio, A.J., **Ingeniería Térmica**, UNED,
Çengel Y.A.; Ghajar, A.J., **Transferencia de calor y masa**, McGraw-Hill/Interamericana de España, D.L.,
Kohan, Anthony L., **Manual de calderas**, McGraw-Hill,

Recommendations

Subjects that it is recommended to have taken before

Physics: Physics I/V12G380V01102
Physics: Physics II/V12G380V01202
Chemistry: Chemistry/V12G380V01205
Thermodynamics and heat transfer/V12G380V01302

Other comments

To enrol in this subject is necessary to have surpassed or be enrolled of all the subjects of the inferior courses.

Contingency plan

Description

=== EXCEPTIONAL MEASURES SCHEDULED ===
In front of the uncertain and unpredictable evolution of the sanitary alert caused by the COVID-19, the University of Vigo establishes an extraordinary planning that will activate in the moment in that the administrations and the own institution determine it attending to criteria of security, health and responsibility, and guaranteeing the teaching in a no face-to-face stage or partially face-to-face. These already scheduled measures guarantee, in the moment that was prescriptive, the development of the teaching of a more agile and effective way when being known in advance by the students and the teachers through the tool normalised and institutionalised of the educational guides.

=== ADAPTATION OF THE METHODOLOGIES ===

* Educational Methodologies that modify
The classes of theory and problems will give of virtual or mixed form keeping the same contents with help of the remote campus and of the available means.
The classes of laboratory will give of virtual or mixed form with help of document cameras, videos, specific computer programs and other means that consider adapted for the correct acquisition of the competitions.

* Mechanism no face-to-face of attention to the students (*tutorías)
The tutorials will attend so much through the email as with the help of the virtual rooms of the teaching or other systems that consider timely.

* Modifications (if they proceed) of the contents to give
The contents keep.

* Additional bibliography to facilitate the car-learning
The bibliography keeps .

* Other modifications

=== ADAPTATION OF THE EVALUATION ===

* Test already made
Conserve his weights.

* Pending proofs that keep
All the proofs of evaluation are supported by the same weights, happening to make telematic in function of the available means facilitated to the faculty.

IDENTIFYING DATA

Elasticity and additional topics in resistance of materials

Subject	Elasticity and additional topics in resistance of materials			
Code	V12G380V01502			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	9	Mandatory	3rd	1st
Teaching language	Spanish			
Department				
Coordinator	Badaoui Fernández, Aida			
Lecturers	Badaoui Fernández, Aida Barros González, Brais Caride Tesouro, Luís Miguel Comesaña Piñeiro, Rafael García González, Marcos Lorenzo Mateo, Jaime Alberto Pérez Riveiro, Adrián Riveiro Rodríguez, Antonio			
E-mail	aida@uvigo.es			
Web				
General description	This course will study the fundamentals of elasticity and deepen the study of mechanics of materials in order to be able to apply their knowledge to the actual behavior of solids (structures , machinery and resistant elements in general). This course, along with mechanics of materials course, is a holder of more specialized subjects whose object is the mechanical design.			

Competencies

Code	
CG3	CG3 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.
CG4	CG4 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.
CE22	CE22 Knowledge and skills to apply the fundamentals of elasticity and strength of materials to the actual behavior of solids.
CT2	CT2 Problems resolution.
CT5	CT5 Information Management.
CT9	CT9 Apply knowledge.
CT10	CT10 Self learning and work.
CT17	CT17 Working as a team.

Learning outcomes

Learning outcomes	Competences		
Knowledge of the foundations of elasticity theory	CG3	CE22	
Further deepening on mechanics of materials and stress analysis	CG3 CG4	CE22	CT2 CT10
Knowledge of deformations in beams and shafts	CG3 CG4	CE22	CT2 CT9
Ability to apply the knowledge of elasticity and mechanics of materials, and to analyze the mechanical performance of machines, structures, and general structural elements	CG4	CE22	CT2 CT5 CT9
Ability to take decisions about suitable material, shape and dimensions for a structural element subjected to a specific load	CG4	CE22	CT2 CT5 CT9 CT17
Knowledge of different solving methods for structural problems and ability to choose the most suitable method for each specific problem	CG4	CE22	CT2 CT5 CT9

Contents

Topic	
Fundamentals of elasticity	Introduction to the theory of elasticity Stress analysis of elastic solids Strain Stress-strain relationships Two-dimensional elasticity
Criteria of failure based in tensions	Saint-Venant's failure criterion Tresca's failure criterion Von-Mises' failure criterion Safety coefficient
Bending	Non uniform bending: Shear stresses. Zhuravski expression Principal stresses. Stress trajectories Bending and axial load: Normal stresses. Neutral axis Eccentric axial loads Kern of the cross-section Beams of different materials
Bending. Statically indeterminate beams	General method Settlements in fixed supports Continuous beams Simplifications in symmetric and antisymmetric beams
Torsion	Definition Coulomb's fundamental theory Static torque diagrams Stress and angle of twist Statically indeterminate problems
Combined loads	Definition Bending and torsion loaded circular shafts Shear center Stress and strain calculation in plane-spatial structures
Strain energy and energy methods	Strain energy: Axial load/shearing loads/bending/torsion/general expression. Clapeyron's theorem Indirect and direct work Maxwell-Betti Reciprocal Theorem Applications Castigliano's theorem. Mohr's integral. Applications
Buckling	Introduction Buckling and stability Euler's buckling. Critical load Buckling effective length Application limits of Euler's formula. Real buckling Eccentric compression of slim columns Shearing force and critical load

Planning			
	Class hours	Hours outside the classroom	Total hours
Introductory activities	1	0	1
Previous studies	0	6	6
Lecturing	20	40	60
Problem solving	30	41	71
Laboratory practical	24	6	30
Autonomous problem solving	0	20	20
Problem and/or exercise solving	2	23	25
Self-assessment	0	8	8
Laboratory practice	1	3	4
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Introductory activities	Introduction to the subject: Course aims, expected learning outcomes, course syllabus, teaching methods, assessments and grading policy.

Previous studies	Student previous activities to lectures (compulsory submission): The students will receive detailed instructions to complete and send certain exercises before lectures/laboratory sessions. The purpose of this assessment is to optimize the session outcome. The delivery of these exercises will modify the obtained qualification of the continuous assessment (laboratory practices and conceptual tests) as explained in the section of "Other comments and second call" in this guide.
Lecturing	The contents of the subject will be presented in a organized way. Special emphasis will be put on the fundamentals of the subject and on the most troublesome points. To improve the comprehension, the contents of the next lectures will be announced on Tema platform on a weekly basis.
Problem solving	Each week will devote a time to the resolution by part of the student of exercises or problems proposed, related with the content that was seeing in the moment.
Laboratory practical	Application of theory concepts to laboratory collaborative works.
Autonomous problem solving	The students will be supplied with exercises and problems to solve, the solutions will be provided for level self-evaluation.

Personalized assistance

Methodologies	Description
Autonomous problem solving	

Assessment

	Description	Qualification	Evaluated Competencess		
Previous studies	The delivery of these exercises will modify the obtained qualification of the continuous assessment (laboratory practices and conceptual tests) as explained in the section of "Other comments and second call" in this guide. It shall be deemed completed when a previous activity fully answer all questions.	0			CT5 CT9 CT10 CT17
Laboratory practical	Attendance and active participation in the complete laboratory lessons and practice reports will be assessed. They will be graded from 0 to 10, provided that the student gets a minimum mark in the written examination (minimum mark: 4.5/10). The qualification will be modified by the coefficient introduced in the "Other comments and second call" section in this guide.	5	CG4	CE22	CT2 CT5 CT9 CT10 CT17
Problem and/or exercise solving	Exam for the assessment of the module learning outcomes. The exam comprises of brief problems and/or theoretical questions. The duration and precise grading will be communicated at the beginning of the exam.	80	CG3 CG4	CE22	CT2 CT9
Laboratory practice	Short exercises and conceptual tests will be taken during the course (within lecture or laboratory hours; grading from 0 to 10). The mark will be added to the exam mark, provided that the student gets a minimum mark in the written examination (minimum mark: 4.0/10). The qualification will be modified by the coefficient introduced in the "Other comments and second call" section in this guide	15	CG3		CT9

Other comments on the Evaluation

In this module the minimum required mark to pass is 5 out of 10.

The written examination of students not able to attend laboratory sessions will be graded 100% of the module mark, provided the student resigns from continuous assessment (and gets the required school approval) within the period established for that purpose. This examination will assess the subject overall competencies.

The qualification obtained in the laboratory practices in the course 2020/2021 (5% of the qualification) will be preserved in 2021/2022, provided the student requests that within an established period in the beginning of the course.

The qualification obtained in the conceptual tests in the course 2020/2021 (15% of the qualification) will be preserved in 2021/2022, provided the student requests that within an established period in the beginning of the course.The rating obtained only remain within the language chosen at the time in which he studied the subject.

Comments about continuous assessment:

The handing of previous exercises (within the established period for each exercise) will modify the qualification of laboratory practices and follow-up conceptual tests as following explained:

Qualification of laboratory practices = K□(overall practice grade)/(nr of laboratory sessions)

Qualification of conceptual tests = K □(addition of tests□ grades)/(nr of tests)

K = (nr of previous exercises delivered)/(total nr of previous exercises)

Additional comments:
The absence from a laboratory session, even justified, does not lead to the repetition of the session.
The absence from a test, even justified, does not lead to the repetition of the test.
The date and place of of examinations of all calls shall be determined by the center before the start of course and will make them public .

Ethical commitment: it is expected an adequate ethical behaviour of the student. In case of detecting unethical behaviour (copying, plagiarism, unauthorized use of electronic devices, etc.) shall be deemed that the student does not meet the requirements for passing the subject. In this case, the overall rating in the current academic year will be Fail (0.0).
The use of any electronic device for the assessment tests is not allowed unless explicitly authorized. The fact of introducing unauthorized electronic device in the examination room will be considered reason for not passing the subject in the current academic year and will hold overall rating (0.0).

Group responsible lecturer: Groups with teaching in Spanish: Aida Badaoui Fernández (aida@uvigo.es)/ Marcos García (marcos.g.glez@uvigo.es) , Pérez Riveiro, Adrián (adperez@uvigo.es).
Group with teaching in English: Rafael Comesaña Piñeiro (racomesana@uvigo.es), Antonio Riveiro (ariveiro@uvigo.es)

Reading list for the group in English:
Recommended:
- Hibbeler R.C., Mechanics of Materials, SI Edition, Prentice Hall. 9th. edition
- José Antonio González Taboada , Tensiones y deformaciones en materiales elásticos, 2a Edición, Tórculo.
- José Antonio González Taboada , Fundamentos y problemas de tensiones y deformaciones en materiales elásticos, 1ª Edición, Tórculo.
Complementary:
- Timoshenko, Goodier, Theory of elasticity, 3rd ed., (International student ed.), McGraw-Hill
- Manuel Vázquez , Resistencia de Materiales.

Sources of information
Basic Bibliography
José Antonio González Taboada, **Tensiones y deformaciones en materiales elásticos**, 2a Edición,
José Antonio González Taboada, **Fundamentos y problemas de tensiones y deformaciones en materiales elásticos**, 1a Edición,
Complementary Bibliography
Manuel Vázquez, **Resistencia de Materiales**,
Luis Ortiz-Berrocal, **Elasticidad**, 3a Edición,
Recommended: Hibbeler R.C., **Mechanics of Materials, SI Edition**, 10th Edition in SI units,
Complementary: Timoshenko, Goodier., **Theory of elasticity**, 3rd ed., International student ed.,

Recommendations
Subjects that continue the syllabus
Machine design I/V12G380V01304

Subjects that it is recommended to have taken before

Physics: Physics I/V12G380V01102
Physics: Physics II/V12G380V01202
Resistance of materials/V12G380V01402

Other comments

To register for this module the student must have passed or be registered for all the modules of the previous years.

The original teaching guide is written in Spanish. In case of discrepancies, shall prevail Spanish version of this guide.

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 ===
* Teaching methodologies maintained

* Teaching methodologies modified

* Non-attendance mechanisms for student attention (tutoring)

The tutorials will be carried out by e-mail to the teacher of the subject, who will be able to resolve the doubts by e-mail, or invite the student to participate in a tutorial through the Remote Campus remote teaching tools. Moovi Forums will also be enabled, if required.

* Modifications (if applicable) of the contents

* Additional bibliography to facilitate self-learning

* Other modifications

=== ADAPTATION OF THE TESTS ===
* Tests already carried out
Test XX: [Previous Weight 00%] [Proposed Weight 00%]
...

* Pending tests that are maintained
Test XX: [Previous Weight 00%] [Proposed Weight 00%]
...

* Tests that are modified
[Previous test] => [New test]

* New tests

* Additional Information

IDENTIFYING DATA				
Enxeñaría de materiais				
Subject	Enxeñaría de materiais			
Code	V12G380V01504			
Study programme	Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	3	1c
Teaching language	Castelán			
Department	Enxeñaría dos materiais, mecánica aplicada e construción			
Coordinator	Pérez Vázquez, María Consuelo			
Lecturers	Collazo Fernández, Antonio Cortes Redin, María Begoña Iglesias Rodríguez, Fernando Pérez Vázquez, María Consuelo Riobó Coya, Cristina			
E-mail	mcperez@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	Nesta materia preténdese axuntar os fundamentos científicos que xustifican a relación entre estrutura, propiedades e comportamento, cos aspectos máis tecnolóxicos da forma en que esas interaccións mutuas ven afectadas polos procesos de elaboración e polas condicións de servizo.			

Competencias	
Code	
CG3	CG3 Coñecemento en materias básicas e tecnolóxicas que os capacite para a aprendizaxe de novos métodos e teorías, e os dote de versatilidade para adaptarse a novas situacións.
CG4	CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial na especialidade de Mecánica.
CG5	CG5 Coñecementos para a realización de medicións, cálculos, valoracións, taxacións, peritaxes, estudos, informes, planes de labores e outros traballos análogos.
CG6	CG6 Capacidade para o manexo de especificacións, regulamentos e normas de obrigado cumprimento.
CG11	CG11 Coñecemento, comprensión e capacidade para aplicar a lexislación necesaria no exercicio da profesión de Enxeñeiro Técnico Industrial.
CE25	CE25 Coñecementos e capacidades para a aplicación da enxeñaría de materiais.
CT5	CT5 Xestión da información.
CT7	CT7 Capacidade para organizar e planificar.
CT9	CT9 Aplicar coñecementos.
CT10	CT10 Aprendizaxe e traballo autónomos.
CT15	CT15 Obxectivación, identificación e organización.
CT17	CT17 Traballo en equipo.

Resultados de aprendizaxe	
Learning outcomes	Competences

□ Coñece os principais procesos de conformación e transformación de materiais usados na industria. □ Demostra capacidade para seleccionar o proceso de elaboración máis adecuado para a obtención de pezas básicas a partir dun material determinado. □ Coñece os principais procesos de unión dos materiais usados na industria. □ Comprende as complexas interrelaciones entre as propiedades dos materiais e os procesos de conformación e unión para poder optimizar as propiedades e a produtividade nunha ampla marxe de sectores industriais. □ Coñece as características dos materiais máis habitualmente empregados en Enxeñaría. □ Coñece a evolución dos distintos tipos de materiais e dos procesos para a súa posible conformación. □ Coñece e aplica os criterios para a selección do material máis adecuado para unha aplicación concreta □ Analiza e propón solucións operativas a problemas no ámbito da enxeñaría de materiais. □ Interpreta, analiza, sintetiza e extrae conclusións e resultados de medidas e ensaios. □ Redacta textos coa estrutura adecuada aos obxectivos de comunicación. Presenta o texto a un público coas estratexias e os medios adecuados □ Demostra capacidades de comunicación e traballo en equipo. □ Identifica as propias necesidades de información e utiliza os medios, espazos e servizos dispoñibles para deseñar e executar procuras adecuadas ao ámbito temático. □ Leva a termo os traballos encomendados a partir das orientacións básicas dadas polo profesor, decidindo a duración das partes, incluíndo achegas persoais e ampliando fontes de información	CG3 CG4 CG5 CG6 CG11	CE25	CT5 CT7 CT9 CT10 CT15 CT17

Contidos	
Topic	
□ Comportamento mecánico dos materiais. □ Resposta dos materiais sometidos a procesos de conformado por *fundición, moldeo e inxección. □ Resposta dos materiais sometidos a procesos de conformado por deformación plástica, *viscoelástica e *compactación de pos. □ Modificación de materiais mediante tratamentos térmicos, *termoquímicos e *termomecánicos. □ Tecnoloxías da unión e *soldabilidad. □ Aliaxes estructurais □ Materiais compostos	
Partes de laboratorio	Metalografía Ensayo de templabilidade Ensaios mecánicos Ensaios non destrutivos

Planificación			
	Class hours	Hours outside the classroom	Total hours
Prácticas de laboratorio	13	19	32
Traballo tutelado	0	11	11
Seminario	3	3	6
Resolución de problemas	4	8	12
Lección maxistral	33	56	89
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente	
	Description
Prácticas de laboratorio	Actividades de aplicación dos *conocimentos e situacións concretas e da adquisición de habilidades básicas e *procedimentales relacionadas coa materia *objecto de estudo. Desenvólvense en *aboratorios con equipamento especializado.
Traballo tutelado	O estudante, de maneira individual ou en grupo, elabora un documento sobre a temática da materia ou prepara seminarios, investigacións, memorias, ensaios, resumos de lecturas, conferencias, etc.
Seminario	Preténdese facer *unseguimiento do traballo do alumno, así como resolver as *dificulatades que atope na comprensión dos contidos da *asigantura.

Resolución de problemas	Actividade na que o profesor propón aos alumnos unha serie de problemas e/ou exercicios relacionados coa materia, para que traballe sobre eles en casa. O alumno debe desenvolver as solucións adecuadas ou correctas mediante a realización de rutinas, a aplicación de fórmulas ou *algoritmos, a aplicación de procedementos de transformación da información dispoñible e a interpretación dos resultados. A resolución dos problemas farase en clase, por parte do profesor ou dalgún alumno.
Lección maxistral	Exposición oral e directa, por parte do profesor, dos coñecementos fundamentais correspondentes aos temas da materia en cuestión.

Atención personalizada

Methodologies	Description
Traballo tutelado	de artículos de revistas científicas
Seminario	no hay grupos C

Avaliación

	Description	Qualification	Evaluated Competencess	
Prácticas de laboratorio	Las actividades formativas de carácter práctico se evaluarán según los criterios de asistencia y grado de participación, informes de desarrollo de prácticas y una prueba de evaluación al final del período de impartición de las clases prácticas.	15		CT5 CT9 CT10 CT15 CT17
Traballo tutelado	Avaliaranse polos informes presentados, e a exposición en clase dos traballos.	15	CG3 CG4 CG11	CT9 CT10 CT15 CT17
Lección maxistral	Se realizará mediante dos pruebas escritas (preguntas cortas, problemas y tipo test) que recoja los conocimientos adquiridos por el alumno a lo largo del curso. Una prueba se realizará durante el período de impartición de la materia (20%) y la otra en la fecha fijada por el centro (50%)	70	CG3 CG4 CG5 CG6 CG11	CT5 CT7 CT9 CT10 CT15

Other comments on the Evaluation

PRIMEIRA EDICIóN: A avaliación continua realizarase durante o periodo de impartición da materia, segundo os criterios establecidos no criterios establecidos no apartado anterior.

Para superar a materia na primeira edición da acta, deberáse acadar un 40% como mínimo da nota asignada ao exame final (2 ptos/5 puntos). A nota correspondente á materia, será (neste caso) a suma da nota alcanzada no exame realizado na data marcada polo centro e a nota da avaliación continua.

No caso de que non se acade o 40% da nota asignada ao exame, a materia non se considerará superada. A nota que figurará na acta será a correspondente á máxima cualificación obtida, ben na avaliación continua, ben no exame.

Aqueles alumnos que oficialmente renuncien á avaliación continua, farán un exame sobre a totalidade dos contidos (impartidos tanto nas clases teóricas como nas prácticas) na data marcada polo centro, sobre unha puntuación de 10 puntos.

SEGUNDA EDICIÓN (exame de Xullo):

Na segunda edición da acta, manteráse a nota da avaliación continua, agás que o alumno, no prazo establecido polo profesor/a, comunique a súa renuncia. Neste caso, para superar a materia manteránse os mesmos requisitos que na primeira edición da acta.

No caso de renuncia á nota da avaliación continua, ben de forma voluntaria ben de forma oficial, para aprobar a materia, o alumno deberá obter 5 puntos sobre 10 no exame final. Os contidos obxecto de avaliación neste examen , corresponderán a á totalidade da materia impartida (teoría + prácticas).

Compromiso Ético: Espérase que o alumno/a presente un comportamento ético adecuado. No caso de detectar un comportamento non ético (copia, plaxio, emprego de aparellos eléctricos non autorizados, e outros) considerarase que ó alumno non reune os requisitos necesarios para superar a materia. Neste caso, a cualificación global non presente curso

académico sera de suspenso (0.0).

Bibliografía. Fontes de información

Basic Bibliography

Kalpakjian, S. y Schmid, S. R.,, **Manufactura, Ingeniería y Tecnología**, Pearson Educación,

Mikell P. Groover, **Fundamentos de Manufactura Moderna: Materiales, Procesos y Sistemas**, Prentice Hall, Hispanoamericana, S.A,

G. E. DIETER, **MECHANICAL METALURGY**, McGraw-Hill Book Company,

Complementary Bibliography

Manuel Reina Gómez, **Soldadura de los aceros, aplicaciones.**, Gráficas Lormo,

Sindo Kou, **Welding Metallurgy**, John Wiley & Sons,

GEORGE KRAUSS, **STEELS: Heat Treatment and Processing Principles**, ASM International,

BROOKS, CH., **Principles of the Surface Treatment of Steels.**, Inc. Lancaster,

M. G. RANDALL, **Sintering: Theory and Practice**, John Wiley & Sons,

P. Beeley, **Foundry Tecnology**, Butterworth-Heineman, Ltd.,

Recomendacións

Subjects that continue the syllabus

Materiais e tecnoloxías en fabricación mecánica/V12G380V01912
Selección de materiais e fabricación de medios de produción/V12G380V01932
Sistemas fluidomecánicos e materiais avanzados para o transporte/V12G380V01942

Subjects that it is recommended to have taken before

Ciencia e tecnoloxía dos materiais/V12G380V01301

Other comments

Requisitos:
Para matricularse nesta materia é necesario superar ou ben estar matriculado de todas as materias dos cursos inferiores ao curso no que está situada esta materia.

En caso de discrepancias, prevalecerá a versión en castelán desta guía.

Plan de Continxencias

Description

=== MEDIDAS EXCEPCIONAIS PLANIFICADAS ===
Ante a incerta e imprevisible evolución da alerta sanitaria provocada pola COVID-19, a Universidade de Vigo establece unha planificación extraordinaria que se activará no momento en que as administracións e a propia institución determíneno atendendo a criterios de seguridade, saúde e responsabilidade, e garantindo a docencia nun escenario non presencial ou parcialmente presencial. Estas medidas xa planificadas garanten, no momento que sexa preceptivo, o desenvolvemento da docencia dun modo máis áxil e eficaz ao ser coñecido de antemán (ou cunha ampla antelación) polo alumnado e o profesorado a través da ferramenta normalizada e institucionalizada das guías docentes.
=== ADAPTACIÓN DAS METODOLOXÍAS ===
* Metodoloxías
Adecuaranse aos medios telemáticos que se poñan a disposición do profesorado, ademais da documentación facilitada a través de FAITIC, correo electrónico e Campus Remoto.
* Mecanismo non presencial de atención ao alumnado (titorías)
As titorías poderán desenvolverse de forma presencial (sempre que sexa posible garantir as medidas sanitarias) ou telemáticas (correo electrónico, campus remoto ou foros faitic) baixo a modalidade de concertación previa. Farase unha adecuación metodolóxica ao alumnado de risco, facilitándolle información específica adicional, de acreditarse que non pode ter acceso aos contidos impartidos de forma convencional.
=== ADAPTACIÓN DA AVALIACIÓN ===
Manteranse aquelas probas que xa veñen realizando de forma telemática e, na medida do posible, manteranse as probas presenciais adecuándoas á normativa sanitaria vixente. As probas desenvolveranse de forma presencial salvo Resolución Reitoral que indique que se deben facer de forma non presencial, realizándose desta forma a través das distintas ferramentas postas a disposición do profesorado. Aquelas probas non realizables de forma telemática supliranse por outras (entregas de traballo autónomo guiado, etc.)

* Modificación do peso de avaliación continua.
Avaliación continua [Peso anterior 40%] [Peso Proposto 60%]

IDENTIFYING DATA				
Máquinas de fluídos				
Subject	Máquinas de fluídos			
Code	V12G380V01505			
Study programme	Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	3	1c
Teaching language	Castelán			
Department	Enxeñaría mecánica, máquinas e motores térmicos e fluídos			
Coordinator	Concheiro Castiñeira, Miguel			
Lecturers	Concheiro Castiñeira, Miguel Gil Pereira, Christian			
E-mail	mconcheiro@uvigo.es			
Web				
General description	O obxectivo da materia Máquinas de Fluídos céntrase no estudo dos coñecementos científicos e das aplicacións técnicas dos dispositivos transformadores de enerxía que utilizan un fluído como medio intercambiador de enerxía. Esta aplicación da mecánica de fluídos á tecnoloxía faise formativa nun sentido industrial tratando o funcionamento das máquinas de fluídos máis usuais e os seus campos de aplicación. Os criterios para o deseño de instalacións de fluídos e o deseño das propias máquinas son obxecto de materias posteriores específicas das orientacións, respectivamente, Instalacións de Fluídos, Deseño de Máquinas Hidráulicas e Sistemas *Fluidomecánicos para o transporte, polo que, ademais, a materia Máquinas de Fluídos proporciona os coñecementos de partida para esas materias.			

Competencias	
Code	
CG3	CG3 Coñecemento en materias básicas e tecnolóxicas que os capacite para a aprendizaxe de novos métodos e teorías, e os dote de versatilidade para adaptarse a novas situacións.
CE24	CE24 Coñecemento aplicado dos fundamentos dos sistemas e máquinas fluidomecánicas.
CT2	CT2 Resolución de problemas.
CT9	CT9 Aplicar coñecementos.
CT10	CT10 Aprendizaxe e traballo autónomos.
CT17	CT17 Traballo en equipo.

Resultados de aprendizaxe			
Learning outcomes	Competences		
Comprender os aspectos básicos das máquinas de fluído	CG3	CE24	CT2 CT9 CT10 CT17
Adquirir habilidades sobre o proceso de *dimensionado de instalacións de bombeo e máquinas de fluídos		CE24	CT2 CT9 CT10 CT17

Contidos	
Topic	
Máquinas de fluídos	1.1.-Concepto e definición. 1.2.-Clasificación. 1.2.1.-Máquinas hidráulicas. 1.2.2.-Máquinas térmicas. 1.3.-Máquinas hidráulicas. Clasificacións.

Turbomáquinas: Principios xerais	2.1. Definicións. 2.1.1. Clasificacións. 2.1.2. Aplicacións de TMH. 2.2. Compoñentes da velocidade. Triángulos de velocidade. 2.3. Fluxo nas turbomáquinas. 2.3.1. Fluxo radial. 2.3.2. Fluxo axial. 2.3.3. Fluxo diagonal, semiaxial ou mixto. 2.3.4. Fluxo tangencial. 2.3.5. Fluxo cruzado. 2.4. Teoría xeral das turbomáquinas hidráulicas. 2.4.1. Acción do fluído sobre os álabes. 2.4.2. Ecuación de EULER. 2.4.3. Ecuación de Bernoulli para o movemento relativo. 2.4.4. Grado de reacción. 2.4.5. Ecuación de Euler para turbobombas. 2.4.6. Ecuación de Euler para turbinas. 2.5. Teoría ideal unidimensional de turbomáquinas hidráulicas. 2.5.1. Teoría ideal unidimensional para turbomáquinas radiales. 2.5.2. Teoría ideal unidimensional para turbomáquinas axiales. 2.5.3. Notas á teoría unidimensional. 2.6. Teoría ideal bidimensional de turbomáquinas radiales. Influencia do número de álabes. 2.7. Alturas, caudales, potencias, perdas e rendementos. 2.7.1. Límites de entrada e saída da máquina. 2.7.2. Alturas. 2.7.3. Clasificación das perdas e rendementos. 2.7.4. Potencias. 2.7.5. Rendementos. 2.8. Leis de funcionamento das turbomáquinas. 2.8.1. Leis de semellanza das turbinas hidráulicas. 2.8.2. Leis de semellanza das turbobombas. 2.8.3. Velocidade específica. 2.8.4. Coeficientes de velocidade.
Turbobombas	3.1. Características xerais. 3.2. Clasificación. 3.3. Comparación entre bombas rotodinámicas e bombas de desprazamento positivo. 3.4. Curva característica ideal. Curva característica real. 3.5. Ensaio elemental e ensaio completo. 3.6. Turbobombas axiales e diagonales. 3.7. Funcionamento dunha bomba nunha instalación. 3.7.1. Diagramas de transformación de enerxía e de perdas. 3.7.2. Punto de funcionamento dunha bomba nunha instalación. 3.7.3. Acoplamiento de bombas. 3.8. Transitorios e anomalías no funcionamento. 3.8.1. Cebado da bomba. 3.8.2. Cavitación. 3.8.3. Golpe de ariete.
Turbinas hidráulicas	4.1. Características xerais turbinas hidráulicas 4.2. Clasificación 4.3. Turbinas de acción 4.3.1. Elementos constitutivos das turbinas Pelton 4.3.2. Estudo unidimensional das turbinas Pelton 4.3.3. Balance energético. Perdas interiores 4.3.4. Regulación de caudal en turbinas Pelton 4.3.5. Curvas Características 4.3.6. Funcionamento anómalo 4.4. Turbinas de reacción 4.4.1. Elementos constitutivos 4.4.2. Turbinas Francis 4.4.3. Turbina Kaplan 4.4.4. Regulación de caudal en turbinas de reacción 4.4.5. Curvas Características 4.4.6. Funcionamento anómalo 4.5. Criterios de selección

Máquinas de desprazamento positivo	6.1. Principio de funcionamento. 6.2. Clasificacións 6.2.1. Segundo o movemento do desplazador 6.2.2. Segundo a variabilidade do desprazamento 6.2.3. Segundo modo de accionamiento 6.2.4. Segundo compensación hidráulica 6.2.5. Segundo tipos constructivos 6.2.6. Segundo sentido de intercambio enerxía mecánica-fluído 6.3. Aplicacións
Bombas volumétricas alternativas	7.1. Características técnicas 7.2. Bombas alternativas 7.2.1. De émbolo 7.2.1.1. Principio de funcionamento. Tipos 7.2.1.2. Desprazamento. Caudal. Rendemento 7.2.1.3. Campos de aplicación 7.2.2. De diafragma 7.2.2.1. Principio de funcionamento. Tipos 7.2.2.2. Desprazamento. Caudal 7.2.2.3. Características 7.2.2.4. Aplicacións
Bombas volumétricas rotativas e peristálticas	8.1. Características 8.2. Clasificacións 8.3. Bombas de engranajes 8.3.1. Engranajes externos. Características. Aplicacións. Desprazamento. Caudal 8.3.2. Engranajes internos. Bomba de luneta ou media lúa. Bomba gerotor. Bomba de rotor lobular 8.4. Bombas de paletas 8.4.1. Tipos. Características 8.4.2. Rotor excéntrico 8.4.3. Estator ovalado 8.4.4. Paletas fixas 8.4.5. Detalles constructivos 8.4.6. Paletas flexibles 8.5. Bombas de pistones 8.5.1. Tipos. Características. Aplicacións 8.5.2. Pistones radiales bloque excéntrico 8.5.3. Pistones radiales con seguimiento de levas 8.5.4. Pistones paralelos axiales 8.5.5. Pistones paralelos en ángulo 8.6. Bombas de helicoide ou tornillo 8.6.1. Tipos 8.6.2. Bomba de tornillo simple 8.6.3. Bomba de tornillo múltiple 8.7. Bombas peristálticas.
Motores volumétricos rotativos e alternativos	9.1 Motores rotativos. 9.2.-Motores alternativos. Cilindros. 9.3. Accionadores rotativos
PRACTICAS	1. MDP Parte 1ª: Identificación elementos dunha MDP Parte 2ª: Dimensionado de MDP Parte 3ª: Resolución de problemas propostos 2. Turbomáquinas Parte 1ª: Ensaio de caracterización de bomba centrífuga Parte 2ª: Ensaio de caracterización de turbina Francis e Pelton Parte 3ª: Dimensionado de Bombas Parte 4ª: Dimensionado de Turbinas Parte 5ª: Resolución de problemas propostos

Planificación			
	Class hours	Hours outside the classroom	Total hours
Lección maxistral	32.5	60.5	93
Resolución de problemas	8	9	17
Prácticas de laboratorio	10	18	28
Exame de preguntas de desenvolvemento	3	0	3

Resolución de problemas e/ou exercicios	0	6	6
Informe de prácticas, prácticum e prácticas externas	0	3	3

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

Metodoloxía docente

	Description
Lección maxistral	Explícanse os fundamentos de cada tema para a posterior resolución de problemas prácticos. Poderanse realizar actividades como: Sesión maxistral Lecturas Revisión bibliográfica Resumen Esquemas Solución de problemas Conferencias Presentación oral
Resolución de problemas	Aplicaranse os conceptos desenvolvidos de cada tema á solución de exercicios. Inclúe actividades tales como: Lecturas Seminarios Solución de problemas Aprendizaxe *colaborativo Estudo de casos prácticos
Prácticas de laboratorio	Aplicaranse os conceptos desenvolvidos de cada tema á realización de prácticas de laboratorio. Fundamentalmente, realizaranse actividades de experimentación, aínda que tamén poderán realizarse: Casos prácticos Simulación Solución de problemas Aprendizaxe *colaborativo

Atención personalizada

Methodologies	Description
Lección maxistral	Horario de **tutorías: (A principio de curso subiranse a **FAITIC os horarios correspondentes a cada profesor)
Resolución de problemas	Horario de **tutorías: (A principio de curso subiranse a **FAITIC os horarios correspondentes a cada profesor)
Prácticas de laboratorio	Horario de **tutorías: (A principio de curso subiranse a **FAITIC os horarios correspondentes a cada profesor)

Avaliación

	Description	Qualification	Evaluated Competencess	
Resolución de problemas	Resolución de problemas e/ou exercicios propostos, incluíndo:- un número de entregas semanais (non presencial)- unha resolución presencial en horario de prácticas como reforzo do tema	10	CE24	CT2 CT9 CT10
Prácticas de laboratorio	Memoria escrita das actividades realizadas nas sesións de laboratorio, incluíndo resultados da experimentación	10	CE24	CT10 CT17
Exame de preguntas de desenvolvemento	Exame final que poderán constar de: - cuestións teóricas - cuestiones prácticas - ejercicios/problemas - tema a desenvolver	80	CE24	CT2 CT9 CT10

Other comments on the Evaluation

Avaliación continua: representa o 20% da nota. Salvo indicación oficial por parte do centro da renuncia do alumno á avaliación continua, o alumno cursa a materia en devandita modalidade. A nota da avaliación continua non se gardará dun curso escolar a outro para os alumnos repetidores.

Exame final: representa o 80% da nota da materia.Para superar o exame final será necesario obter un mínimo do 30% da nota en todas e cada unha das partes do exame (*MDP e *TM). Si o alumno participa nalgunha das probas de avaliación continua ou no exame final, considerase ao alumno como presentado á materia.COMPORTAMENTO ÉTICO: Espérase que o

alumno presente un comportamento ético acomodado. No caso de detectar un comportamento non ético (copia, plaxio, utilización de aparellos electrónicos non autorizados, e outros) considerarase que o alumno non reúne os requisitos necesarios para superar a materia. Neste caso a cualificación global no presente curso académico será de suspenso (0.0).

Bibliografía. Fontes de información

Basic Bibliography

C. Paz Penín, E. Suarez Porto, A. Eirís Barca, **Máquinas Hidráulicas de Desplazamiento Positivo**,

Agüera Soriano, **Mecánica de fluidos incompresibles y turbomáquinas hidráulicas**, 5ª,

C. Mataix, **Mecánica de fluidos y máquinas hidráulicas**,

Frank M White, **Mecánica de Fluidos**, VI,

C. Mataix, **Turbomáquinas hidráulicas**,

C. Paz, E. Suárez, M.Concheiro, M. Conde, **Turbomáquinas hidráulicas**, 978-84-8158-808-8, Servizo de Publicacións da Universidade de Vigo, 2019

Complementary Bibliography

Recomendacións

Other comments

O alumno debe coñecer e manexar con soltura os principios de conservación da masa, 2º Lei de Newton e 1º Lei da *Termodinámica e estar familiarizado coas propiedades e o comportamento dos fluídos. As materias da titulación onde se imparten estes requisitos previos e imprescindibles son Física, Mecánica de Fluídos e *Termodinámica. Requisitos: Para matricularse nesta materia é necesario superar ou ben estar matriculado de todas as materias dos cursos inferiores ao curso no que está emprazada esta materia.

Plan de Continxencias

Description

=== MEDIDAS EXCEPCIONAIS PLANIFICADAS ===
Ante a incerta e imprevisible evolución da alerta sanitaria provocada pola COVID- 19, a Universidade establece una planificación extraordinaria que se activará no momento en que as administracións e a propia institución o determinen atendendo a criterios de seguridade, saúde e responsabilidade, e garantindo a docencia nun escenario non presencial ou non totalmente presencial. Estas medidas xa planificadas garanten, no momento que sexa preceptivo, o desenvolvemento da docencia dun xeito mais áxil e eficaz ao ser coñecido de antemán (ou cunha ampla antelación) polo alumnado e o profesorado a través da ferramenta normalizada e institucionalizada das guías docentes DOCNET.

=== ADAPTACIÓN DAS METODOLOXÍAS ===
* Metodoloxías docentes que se manteñen
Lección maxistral
Resolución de problemas

* Metodoloxías docentes que se modifican
Prácticas de laboratorio

* Mecanismo non presencial de atención ao alumnado (titorías)
As titorías realizaranse de forma telemática

* Modificacións (se proceder) dos contidos a impartir
No procede

* Bibliografía adicional para facilitar a auto-aprendizaxe
No procede

* Outras modificacións

=== ADAPTACIÓN DA AVALIACIÓN ===
* Probas xa realizadas
Proba XX: [Peso anterior 00%] [Peso Proposto 00%]
...

* Probas pendentes que se manteñen

Proba XX: [Peso anterior 00%] [Peso Proposto 00%]
...

* Probas que se modifican
[prácticas de laboratorio con actividad experimental] => [actividades semellantes guiadas telemáticamente]

* Novas probas

* Información adicional
Mantéñense os criterios de avaliación adecuando a realización das probas, no caso de ser necesario e por indicación en Resolución Reitoral, ós medios telemáticos postos a disposición do profesorado

IDENTIFYING DATA				
Fundamentos de organización de empresas				
Subject	Fundamentos de organización de empresas			
Code	V12G380V01601			
Study programme	Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	3	2c
Teaching language	Castelán			
Department	Organización de empresas e márketing			
Coordinator	Doiro Sancho, Manuel			
Lecturers	Doiro Sancho, Manuel García Lorenzo, Antonio Mandado Vazquez, Alfonso			
E-mail	mdoiro@uvigo.es			
Web				
General description				

Competencias	
Code	
CG8	CG8 Capacidade para aplicar os principios e métodos da calidade.
CG9	CG9 Capacidade de organización e planificación no ámbito da empresa, e outras institucións e organizacións.
CE15	CE15 Coñecementos básicos dos sistemas de produción e fabricación.
CE17	CE17 Coñecementos aplicados de organización de empresas.
CT1	CT1 Análise e síntese.
CT2	CT2 Resolución de problemas.
CT7	CT7 Capacidade para organizar e planificar.
CT8	CT8 Toma de decisións.
CT9	CT9 Aplicar coñecementos.
CT11	CT11 Capacidade para comprender o significado e aplicación da perspectiva de xénero nos diferentes campos do coñecemento e a práctica profesional co obxectivo de lograr unha sociedade máis xusta e igualitaria.
CT18	CT18 Traballo nun contexto internacional.

Resultados de aprendizaxe			
Learning outcomes	Competences		
□ Coñecer a base sobre a que se apoian as actividades relacionadas con a Organización e a Xestión de a Produción.	CG8 CG9	CE15 CE17	CT1 CT2
□ Coñecer o alcance de as distintas actividades relacionadas con a produción.			CT7
□ Adquirir unha visión de conxunto para a ejecución de as actividades relacionadas con a organización e xestión de a produción.			CT8 CT9
□ Realizar unha valoración de os postos de traballo desde un enfoque que axude a o desenvolvemento de as persoas con unha perspectiva de eficiencia e igualdade			CT11 CT18

Contidos	
Topic	
PARTE I. CONTORNA ACTUAL E SISTEMAS PRODUTIVOS	1.CONTORNA ACTUAL DE A EMPRESA.Os SISTEMAS PRODUTIVOS
PARTE II. PREVISIÓN DE A DEMANDA	2. INTRODUCIÓN. COMPOÑENTES. MÉTODOS DE PREVISIÓN DE A DEMANDA: CUANTITATIVOS E CUALITATIVOS
PARTE III. XESTIÓN DE INVENTARIOS E XESTIÓN DE PRODUCIÓN	3.CONCEPTOS BÁSICOS DE Os INVENTARIOS. CONTROL DE INVENTARIOS 4.XESTIÓN DE INVENTARIOS. MODELOS BÁSICOS
PARTE *IV. XESTIÓN DE PRODUCIÓN EN EMPRESAS INDUSTRIAIS	5.PLANIFICACIÓN DE PRODUCIÓN. PLAN AGREGADO. PLAN MESTRE DE PRODUCIÓN 6.PLANIFICACIÓN DE NECESIDADES DE MATERIAIS (*MRP) 7.PLANIFICACIÓN DE CAPACIDADE. PROGRAMACIÓN DE PRODUCIÓN: CRITERIOS E REGRAS BÁSICAS
PARTE *V. INTRODUCIÓN Ao ESTUDO DO TRABALLO	8.INTRODUCIÓN Ao ESTUDO DO TRABALLO. DISTRIBUCIÓN EN PLANTA
PARTE VIN. XESTIÓN LEAN	9.O ENFOQUE LEAN NA XESTIÓN. DEFINICIÓN E OBXECTIVOS. ELEMENTOS LEAN

PARTE *VII. INTRODUCIÓN Á XESTIÓN DA CALIDADE, A SEGURIDADE E O MEDIO AMBIENTE	10. INTRODUCIÓN Á XESTIÓN DA CALIDADE, A SEGURIDADE E O MEDIO AMBIENTE
PRÁCTICAS	1. PREVISIÓN DA DEMANDA 2. CONTROL E XESTIÓN DE INVENTARIOS 3. PLANIFICACIÓN DA PRODUCIÓN *I 4. PLANIFICACIÓN DA PRODUCIÓN *II 5. LISTAS DE MATERIAIS E OPERACIÓNS 6. PLANIFICACIÓN DA CAPACIDADE 7. PROGRAMACIÓN DA PRODUCIÓN 8. ESTUDO DO TRABALLO 9. PROBA GLOBAL

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	32.5	64.5	97
Prácticas con apoio das TIC	18	18	36
Exame de preguntas obxectivas	6	6	12
Práctica de laboratorio	2	3	5

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

Metodoloxía docente

	Description
Lección maxistral	Exposición por parte do profesor dos contidos sobre a materia obxecto de estudo, bases teóricas e/ou directrices do traballo, exercicio ou proxecto a desenvolver polo estudante.
Prácticas con apoio das TIC	Actividades de aplicación dos coñecementos a situacións concretas e de adquisición de habilidades básicas e *procedimentales relacionadas coa materia obxecto de estudo. Desenvólvense en espazos especiais con equipamento adecuado.

Atención personalizada

Methodologies	Description
Lección maxistral	
Prácticas con apoio das TIC	

Avaliación

	Description	Qualification	Evaluated Competencess		
Exame de preguntas obxectivas	2 Teórico-Prácticas: Probas de avaliación continua que se realizarán a o longo do curso, nas clases de teoría, distribuídas de forma uniforme e programadas para que non interfiran no resto das materias. Cada unha destas probas (puntuación sobre 10) constarán dunha parte tipo test (5 puntos) e doutra de exercicios (5 puntos). Para poder superar ou compensar dita proba hai que alcanzar en cada unha das partes polo menos 1,75 puntos	60	CG8 CG9	CE15 CE17	CT1 CT2 CT7 CT8 CT9 CT18
Práctica de laboratorio	1 Práctica de exercicios: Proba de avaliación continua que se realizará en as clases de prácticas.	40	CG8 CG9	CE15 CE17	CT1 CT2 CT7 CT8 CT9 CT18

Other comments on the Evaluation

COMPROMISO ÉTICO Espérase que o alumno presente un comportamento ético adecuado. En o caso de detectar un comportamento non ético (copia, plagio, utilización de aparellos electrónicos non autorizados, e outros) considerarase que o alumno non reúne os requisitos necesarios para superar a materia. En este caso a cualificación global en o presente curso académico será de suspenso (0,0). Non se permitirá a utilización de ningún dispositivo electrónico durante as probas de avaliación salvo autorización expresa. O feito de introducir un dispositivo electrónico non autorizado en o aula de exame será considerado motivo de non superación de a materia en o presente curso académico e a cualificación global será de suspenso (0,0) OUTROS COMENTARIOS En todos os casos, en cada proba (teórico-práctica ou de exercicios) debe alcanzarse un mínimo de 4 puntos para que se poida compensar con o resto de notas. Soamente poderase compensar unha proba cando o resto de as notas estean por encima de o valor mínimo (4). Aclaración A modo de exemplo, un alumno que teña as seguintes puntuaciones: 4, 4 e 7 compensaría as partes con a nota de 4 e superaría a materia. En o caso de que as notas

obtidas fosen 3, 4 e 8 NON compensa a materia e tampouco compensa a proba con a nota de 4 (xa que o resto de as notas non cumpren a condición de o valor mínimo de 4 puntos). En este último caso o alumno tería que ir a Xaneiro/Xuño con a proba reducida ou ampliada, segundo o caso. Sinalar que a a hora de facer a media entre as diferentes partes debe terse en conta a ponderación de as mesmas. AVALIACIÓN CONTINUA (cualificación sobre 10) Para superar a materia por Avaliación Continua deben cumprirse os seguintes puntos: 1. É imprescindible realizar con aprovechamiento as prácticas de a asignatura asistindo a as mesmas e entregando a resolución de os exercicios propostos. Só se permitirán 2 faltas a o longo de todo o curso, debéndose entregar a resolución de as mesmas. O comportamento inadecuado en as clases se penalizará coma se fose unha falta. Unha vez superado o tope de as 2 faltas non se poderá aprobar a materia por avaliación continua. 2. . Débense superar (e/ou compensar) todas as probas (teórico-prácticas e de exercicios). Os alumnos que superen a Avaliación Continua quedarán exentos de as convocatorias oficiais. No entanto, poderán presentarse en o caso de que queiran optar a maior nota. En o caso de superar a Avaliación Continua e presentarse a as convocatorias oficiais, a nota final será a que se obteña como resultado de ambas probas. CONVOCATORIAS OFICIAIS (cualificación sobre 10) Os alumnos que NON superen a avaliación continua e teñan soamente una de as tres probas pendente, poderán recuperar esta únicamente en a convocatoria de Xaneiro/Xuño. En o resto de os casos: a) Aqueles alumnos que desenvolvan con aprovechamiento as prácticas (é dicir, que asistan e entregado as resolución de as mesmas), realizarán unha proba reducida con un parte teórico-práctica (60% de a nota) e outra de exercicios (40% de a nota). b) Aqueles alumnos que non cumpran a condición de as prácticas, realizarán unha proba ampliada con unha parte teórico-práctica (60% de a nota) e outra de exercicios (40% de a nota). Cualificación final. A nota final de o alumno calcularase a partir de as notas de as distintas probas tendo en conta a ponderación de estas (probas tipo test 60% e parte de prácticas 40%). En calquera caso, para superar a materia é condición necesaria superar todas a partes ou ben ter unha media de aprobado sen que ningunha de as notas sexa inferior a o 4 (nota mínima para compensar). En os casos en os que a nota media sexa igual ou superior a o valor de o aprobado pero en algunha de as parte non se alcanzou o valor mínimo de 4, a cualificación final será de suspenso. A modo de exemplo, un alumno que obteña as seguintes cualificacións: 5, 9 e 1 estaría suspenso, aínda cando a nota media dá un valor >=5, a o ter unha de as partes por baixo de a nota de corte (4). En estes casos, a nota que se reflectirá en o acta será de suspenso (4).

Bibliografía. Fontes de información

Basic Bibliography

Chase, R.B y Davis, M.M., **Administración de Operaciones. Producción y cadena de suministros**, McGraw-Hill, 2014

hase, R.B y Davis, M.M., **Administración de Operaciones. Producción y cadena de suministros**, McGraw-Hill, 2014

Krajewski, Ritzman y Malhotra, **Administración de Operaciones. Procesos y cadena de suministro**, Pearson, 2013

Complementary Bibliography

Heizer, J. y Render, B., **Dirección de la Producción y de Operaciones. Decisiones Estratégicas y Tácticas**, Pearson, 2015

Larrañeta, J.C., Onieva, L. y Lozano, S., **Métodos Modernos de gestión de la Producción**, Alianza Editorial, 1995

Schroeder, R.G., **Administración de Operaciones**, McGraw-Hill, 2011

Recomendacións

Other comments

Para matricularse nesta materia é necesario ter superadas ou ben estar matriculado de todas as materias dos cursos inferiores ao curso no que está emprazada esta materia.

En caso de discrepancias, prevalecerá a versión en castelán desta guía.

Plan de Continxencias

Description

=== MEDIDAS EXCEPCIONAIS PLANIFICADAS ===

Ante a incerta e imprevisible evolución da alerta sanitaria provocada polo *COVID-19, a Universidade de Vigo establece unha planificación extraordinaria que se activará no momento en que as administracións e a propia institución determíneno atendendo a criterios de seguridade, saúde e responsabilidade, e garantindo a docencia nun escenario non presencial ou parcialmente presencial. Estas medidas xa planificadas garanten, no momento que sexa preceptivo, o desenvolvemento da docencia dun modo máis áxil e eficaz ao ser coñecido de antemán (ou cunha ampla antelación) polo alumnado e o profesorado a través da ferramenta normalizada e institucionalizada das guías docentes.

=== ADAPTACIÓN DAS METODOLOXÍAS ===

* Metodoloxías docentes que se manteñen:

CLASES TEÓRICAS
Utilizaranse os arquivos en formato *pdf das transparencias da materia como documento base para o seguimento da materia. No caso de que algún contido sexa especialmente complicado de comprender ou que suscite numerosas preguntas por parte dos alumnos, incorporarase información adicional (a través dos foros de *Faitic ou mediante a incorporación de documentación complementaria). As clases impartiranse nos horarios habituais, pero a través do campus remoto ou algún outro medio equivalente.

* Metodoloxías docentes que se modifican

CLASES PRÁCTICAS
Proporase a realización dun conxunto de prácticas guiadas que serán enviadas a través de *email/*Faitic ao profesor encargado das prácticas. Para un desenvolvemento adecuado da actividade práctica e poder realizar correctamente os exercicios propostos, é necesario estudar os contidos teóricos correspondentes á temática da práctica. Ademais, para facilitar a realización das prácticas, para cada unha delas mostrarase un práctica tipo resolta, similar á proposta, pero con diferentes datos numéricos/parámetros. Tamén se programarán sesións para resolver dúbidas *online a través do campus remoto.

* Mecanismo non presencial de atención ao alumnado (*tutorías)

Indicaranse franxas horarias para a súa impartición a través do campus remoto e/ou baixo demanda do alumnado previo envío de correo electrónico.

* Modificacións (si proceden) dos contidos a impartir

Non procede

* Bibliografía adicional para facilitar o auto-aprendizaxe

Non procede

* Outras modificacións

Non procede

=== ADAPTACIÓN DA AVALIACIÓN ===
No caso de non poder realizarse as probas de maneira presencial, garántese a mesma estrutura da avaliación presencial (mesmas probas e mesmos pesos). Cando non poidan realizarse de maneira presencial, as probas realizaranse a través dos medios remotos dispoñibles na *UVigo (*Faitic, Campus Remoto,) e estableceranse mecanismos de control adecuados para evitar comportamentos inadecuados que incumpran o código ético establecido pola Universidade de Vigo e a Escola de Enxeñaría Industrial. En calquera caso, garántese que o alumnado poderá superar a materia por avaliación continua sen necesidade de asistir ao exame final oficial recolleito na planificación da Escola.

IDENTIFYING DATA				
Graphic engineering				
Subject	Graphic engineering			
Code	V12G380V01602			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	3rd	2nd
Teaching language	Spanish Galician English			
Department				
Coordinator	Pérez Vázquez, Manuel Cerqueiro Pequeño, Jorge			
Lecturers	Alegre Fidalgo, Paulino Casal Guisande, Manuel Cerqueiro Pequeño, Jorge Comesaña Campos, Alberto Pérez Vázquez, Manuel			
E-mail	jcerquei@uvigo.es maperez@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	The aim of this course is to provide the student with methods and tools to solve engineering problems graphically. After taking it the student will: Be aware of the criteria used for the selection and use of standard parts. Know about the CAD technologies used in geometrical modelling, and how to use them to produce engineering drawings. Be able to perform analysis on the operation of mechanisms from the specifications in the engineering drawings. Know how to apply geometrical tools to solve problems involving mechanisms, constructions, industrial facilities and installations. Possess skills to create and manage graphical information associated to mechanical engineering problems.			

Competencies	
Code	
CG1	CG1 Skills for writing, signing and developing projects in the field of industrial engineering, whose purpose, specializing in Mechanics, construction, alteration, repair, maintenance, demolition, manufacturing, installation, assembly or operation of: structures, mechanical equipments, energy facilities, electrical systems and electronic installations and industrial plants, and manufacturing processes and automation.
CE19	CE19 Knowledge and skills to apply the techniques of engineering graphics.
CT2	CT2 Problems resolution.
CT6	CT6 Application of computer science in the field of study.
CT9	CT9 Apply knowledge.
CT10	CT10 Self learning and work.
CT14	CT14 Creativity.
CT16	CT16 Critical thinking.
CT17	CT17 Working as a team.

Learning outcomes			
Learning outcomes	Competences		
To know and to posess well grounded criteria for the selection and application of standard components.	CG1	CE19	CT2
To know CAD technologies for the geometrical modelling and the generation of technical drawings from it.		CE19	CT6
Ability to perform analysis on the operation of mechanisms from the specifications contained in technical drawings.	CG1	CE19	CT16
To know how to apply Geometry to the resolution of problems about constructions and industrial installations.		CE19	CT2 CT9 CT14
To acquire skills for creating and managing graphic information related to Mechanical Engineering problems.		CE19	CT10 CT14 CT16 CT17

Contents	
Topic	
THEORICAL CONTENTS	
1. Introduction to graphics in Engineering.	1.1. Types of graphics in Engineering. Fields of application. Graphics for the design, the visualisation and the communication. The graphic language. 1.2. Graphic systems. Types and structure of the graphic files. Information management. Hierarchies. Layers. 1.3. Models. Geometrical model. Information associativity.
2. Representation of standard parts and mechanical components.	2.1. Standardization of values. Standard names. 2.2. Representation, dimensioning and standard names of elements: Springs, bearings and their accessories, pulleys. Graphic information in gear wheel drawings. Curves for gear teeth profiles. 2.3. Other forms for the transmission of movement. 2.4. Couplings 2.5. Symbolic representation of mechanisms. 2.6. Materials. Standard designations. 2.7. Criteria for the selection and use of standard elements.
3. Management of variability; functional consequences of tolerancies. Analysis and synthesis of tolerances.	3.1. Variability associated to Mechanical Engineering problems. 3.2. Macro- and micro-geometrical variability. 3.3. Size tolerances and fits. Specification. 3.4. Geometrical tolerances. Specification. 3.5. References and reference systems. 3.6. Surface finishes. Specification. 3.7. Statistical tolerances. Cost functions for tolerances. 3.8. Analysis and synthesis of tolerances. 3.9. Tolerance combination of tolerances: consequences of the tolerance cummulation on the assembly and operation of mechanisms.
4. Conception and representation of elementary mechanical forms. Dimensioning aimed to product function, manufacture and control.	4.1. Constructive forms for the design of casted, forged, shaped and deep-drawn parts. 4.2. Elementary mechanical functions. 4.3. Analysis of the operation conditions of mechanisms. 4.4. Functional dimensioning. Chains of dimensions. 4.5. Dimensioning oriented to the manufacturing process. 4.6. Dimensioning oriented to compliance control.
5. Geometrical product specifications.	5.1. The geometrical specification concept according to ISO. 5.2. Chains of standards. 5.3. Fundamental and global GPS standards. 5.4. General GPS standards matrices. 5.5. Complementary GPS standards matrices. 5.6. Specification operations. 5.7. Interpretation of geometrical specifications based on the operations needed to build them.
6. Diagrams, Nomograms and empirical equations.	6.1. Graphic constructions used in engineering. 6.2. Scales for graphic constructions. 6.3. Diagrams and Nomograms. Volumetric graphs. 6.4. Graphic representation of empirical equations. 6.5. Functions for data analysis.
7. Fundamentals of computer graphics.	7.1. Basic geometrical transformations. 7.2. Grafication of lines: basic algorithms. 7.3. Approximating and interpolating curves: types and applications. 7.4. Geometrical Modeling. Structure of information in 2-D and 3-D CAD files. Entities and solid/surfaces/wire mesh/points models. 7.5. Graphic libraries. 7.6. Product-oriented CAD systems for mechanical design.
8. CAD/CAE/CAM systems. Systems for data acquisition from actual geometries. Rapid prototyping.	8.1. CAx systems. 8.2. CAD/CAM tools. 8.3. CAE tools in the context of Design Engineering. 8.4. Virtual reality: characteristics and devices. Applications in the Engineering field. 8.5. Digitalisation of forms. Reverse engineering projects. 8.6. Rapid prototyping systems. 8.7. Formats for exchanging information.

9. Representation of industrial constructions and installations.	9.1. Symbolic representation of structures. 9.2. Detail drawings of metallic structures. 9.3. Representation and dimensioning of welded joints. 9.4. Drawings for metal-working. 9.5. Symbols and diagrams for oil-hydraulic and pneumatic circuits. 9.6. Symbols and diagrams for fluid conduction systems.
10. Introduction to Industrial Design.	10.1. Design. Types. Industrial Design: product, communication and corporate image. 10.2. Design methodologies. 10.3. Stages in the design process. 10.4. Creativity in the design process. 10.5. Assessment of design alternatives. 10.6. DfX.
PRACTICAL CONTENTS	.
1. Sketching of a mechanical assembly.	The sketching of a mechanical assembly by every student will be proposed. It will include power transmission elements and a high number of standard components. The preliminary process, involving the study, information gathering and analysis, will be performed by groups of three/four students.
2. Modelling of the previous assembly.	Once the previous practical work has been corrected and given back to the students, the modelling of parts and its assembly will be performed, using the CAD software that is available at the laboratory. Every student will work on his own, but groups will be made for idea-sharing and collaborative learning.
3. Making of 2D drawings.	Detail and assembly drawings will be made from the previous models of the assembly, using the CAD software available. The drawings will contain the bill of materials and all necessary specifications -dimensions, macro- and micro-geometrical tolerances, special indications- needed to guarantee optimal operation of the mechanism to which each part belongs.
4. Representations for metal-working.	Solid modelling and plane developments will be performed on a metalworking element, including all the necessary dimensional specifications, using the CAD software available.
5. Making of a report for functionality and exchangeability analysis.	A critical analysis will be performed on the design of exercises 1 to 4, containing an estimation of the expected operational conditions, based on the applied tolerances and their combined effect. A study showing how the tolerance costs could be reduced based on the combined effect of all the intervening ones will also be carried out. CAE analysis will be performed on a relevant part of the design. All pieces from the report will documented, applying as much graphical information from the course work as possible in order to achieve a better understanding of the document.
6. Representation of an industrial facility. Schematics of piping works and other installations.	A small building of the 'industrial unit' kind, hosting a workshop or small mechanical industry, will be represented using the CAD software available, including drawings with all the necessary dimensions and the corresponding construction details of the metallic structure. The symbolic representation of the various relevant installations in the unit: energy, fluids, etc. will be also carried out.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	26	39	65
Problem solving	24	36	60
Project based learning	5	5	10
Seminars	5	10	15

*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 master session. Each topic will be presented by the lecturer using audiovisual resources, this being complemented with the comments that students make, based either on the recommended references or on any others that are relevant for this part of the suject.
Problem solving	Exercises and/or problems will be proposed to be solved along the masterclasses, either partially or fully in class, either individually or in groups, and always with the active orientation of the lecturer. These activities will be oriented to make easier a better understanding of the application and practical utility of the contents of each topic. The purpose of these exercises will also be to provide an orientation on the contents and aims of the laboratory classes.

Project based learning	Realisation of activities that require the active participation of students and the collaboration among them.
Seminars	Realisation of activities to reinforce the learning by means of the tutored resolution in groups of practical cases related with the theory contents of the subject, evaluating along them how the students associate these contents to each one of the different stages developed in the analysis and solution processes of each problem.

Personalized assistance

Methodologies	Description
Seminars	For the election, follow-up and supervision of the works. For all the teaching modalities considered in the Contingency Plan, the tutorial sessions can be carried out using IT tools (email, video-call, FAITIC forums, etc.) according to the modality of prior concertation of the virtual place, date and time.

Assessment

	Description	Qualification	Evaluated Competencess
Lecturing	At the consideration of the lecturer, a number of control tests will be realised -at least a partial test placed about the middle of the course-, in the date previously fixed. The passing of that test will allow the student to remove its contents from the final exam. The final exam, having two independent parts, will be taken by all the students not following the ordinary continuous assessment way. All students must take the second part of such exam, and they can opt for re-take for passing or improving the grades from its first part.	60	CE19 CT10 CT16
Problem solving	The practical activities to be realised will correspond to those indicated in the 'Practical Contents' section, and will be posed to be developed, solved and delivered to the lecturer in the due date indicated for each specific case. Every activity presented will be evaluated in accordance with the criteria previously indicated for it, and will be given back to the students promptly so that the learning coming from such revision can be incorporated to the following practical activities. The calendar for the execution and presentation of the practical activities will be made known at the start of the course.	40 (up to 40)	CG1 CE19 CT2 CT6 CT9 CT14 CT16 CT17

Other comments on the Evaluation

The course can be passed by continuous evaluation after reaching 5.00 points in each one of the the course parts.

All students are requested to attend the final exam, on the date indicated by the School, at least to perform the assessment of the second part of the course. Students will be allowed to re-take the exam of the first part of the course, aiming either to pass it -if they didn't attend or failed the partial exam- or to improve their grade on it. If there are parts failed after the evaluation process, students will be examined from those parts in the final exam, both theory and practice areas, except in those cases that the lecturer considers the possibility of overcoming them by performing some additional or complementary work. The passed parts will be honored regarding the second evaluation call.

Students who renounce the continuous assessment modality are requested to attend the final exam, where the full contents of the course will be assessed. The maximum grade will be 10 points over 10. In this case, the examination of the theoretical part of the contents will be carried out on the date set for it by the School, while the practical part might be carried out at a different time and day.

The student is expected to exhibit adequate ethical behavior. In the case of detecting unethical behavior (copying, plagiarism, use of unauthorized electronic devices, and others) it will be considered that the student does not meet the necessary requirements to pass the subject. In this case, the overall grade in the current academic year will be failed (0.0). The use of any electronic device during the evaluation tests will not be allowed unless expressly authorized.

Sources of information

Basic Bibliography

AENOR, **Normas UNE/EN/ISO diversas actualizadas**, AENOR,

Cordero, J.M.; Cortés, P., **Curvas y Superficies para Modelado Geométrico**, Ra-ma, 2002

Félez, J.; Martínez, M.L., **Ingeniería Gráfica y Diseño**, Síntesis, D.L., 2008

Foley, J. D.; Van Dam, A.; Feiner, S. K.; Hughes, J. F.; Philips, R. L., **Introducción a la Graficación por Computadora**, Addison-Wesley Ib., 1996

Complementary Bibliography

Aguayo, F.; Soltero, V., **Metodología del Diseño Industrial. Un Enfoque desde la Ingeniería Concurrente.**, Ra-ma, 2003

Company, P.; Vergara, M.; Mondragón, S., **Dibujo Industrial**, Publicacions de la Universitat Jaume I, 2007
Farin, G., **Curves and surfaces for computer aided geometric design**, Academic Press, 1997
Fischer, B. R., **Mechanical Tolerance Stackup and Analysis**, Marcel Dekker, Inc., 2004
García, M.; Alcaide, J.; Gómez, T.; Collado-Ruiz, D., **Fundamentos del diseño en la ingeniería**, UPV, 2009
Giesecke F.E.; et al., **Technical Drawing with Engineering Graphics**, Prentice Hall (Pearson Education, 2012
Gómez, S., **El Gran Libro de SolidWorks Office Professional**, Ed. Marcombo, 2010
Hearn, D.; Baker, P., **Gráficos por computador**, Prentice Hall Hispanoamericana, 1995
Jensen, C.; Helsel, J. D.; Short, D. R., **Dibujo y diseño en Ingeniería**, Mc Graw-Hill, 2002
Molero, J., **Autocad 2010: Curso Avanzado**, Anaya Multimedia, 2009

Recommendations

Subjects that continue the syllabus

Product design and communication, and automation of plant elements/V12G380V01931
Systems for product design and development/V12G380V01934
Final Year Dissertation/V12G380V01991

Subjects that are recommended to be taken simultaneously

Machine design I/V12G380V01304

Subjects that it is recommended to have taken before

Graphic expression: Graphic expression/V12G380V01101
Fundamentals of manufacturing systems and technologies/V12G380V01305

Other comments

It is required in order to register in this subject to either have passed all subjects in the former courses, or to be registered in all of them.
It is specifically recommended to have passed the 'Graphic Expression' subject from first year.

Contingency plan

Description

In the face of the uncertain and unforeseeable evolution of the health alert caused by COVID-19, University of Vigo has established an exception planning that will be activated at the time the government offices and the own University mandate it. Such decision will be made based on safety, health and responsibility criteria, always guaranteeing the continuity of the teaching processes in a partial or full non-classroom scenario. Those already-planned steps will guarantee, at the moment it is required, the development of the teaching processes in a more streamlined and effective way as both the students and the lecturers will know about them beforehand (or with a broad anticipation), by means of the DOCNET standard institutional tool.

According to the instructions provided by the Vice-Rectorate for Learning Organization and Teaching Staff, the following three scenarios are required to be taken into account with their corresponding contingency level:

SCENARIO 1. Full-classroom modality.
All teaching activities will be carried out at the classroom, both for theory and laboratory classes, according to the typical way for the course in the years before 2020.

SCENARIO 2. Half-classroom modality.
In the case the half-classroom teaching modality is activated by the University government, such event will involve a reduction in the capacity of the usual teaching spaces where the full-classroom modality is developed. Because of that, as a first measure the School will provide the teaching staff of the course with the information regarding the new authorized capacities for such teaching spaces so that the teaching activities can be re-organized for the remaining time of the term. It must be pointed out that the necessary re-organization to implement will depend on the specific moment in the term in which this teaching modality is activated. The following guidelines will be followed in the re-organization or the teaching activities:

a) Communication. All students in the course will be informed through the FAITIC teaching portal on the specific conditions for the development of the teaching and the evaluation activities that remain until the end of the term.

b) Adaptation of the tutorial and personalized attention to students. The tutorial sessions may be carried out by means of IT tools (email, video-call, FAITIC forums, etc.), according to the modality of prior concertation of the date and time for the session in the lecturers virtual offices.

c) Classroom and non-classroom activities. From the teaching activities that remain until the end of the term, those that could be carried out by all students in class need to be identified (prioritizing laboratory activities when possible), and those other that will be carried out remotely (theory classes are the ones that usually decrease in effectiveness less in this modality), to the effects of the planning of its efficient performance.

d) Teaching contents and learning goals. There will be no changes neither in the contents to be taught nor in the learning goals, as a consequence of this teaching modality.

e) Teaching schedule. The class timetable and the calendar of the different activities in the course will be maintained as initially planned and scheduled.

f) Bibliography or additional materials to facilitate self-learning. The teaching staff for the course will provide the students with the necessary learning materials to attend to the specific help needs of the students with respect to the course, according to the circumstances that turn out at any particular time, through the FAITIC portal.

With regard to the tools used for the teaching activities in the non-classroom modality, the CAMPUS REMOTO and FAITIC portals will be of preferential use, complemented if necessary with other solutions in order to address specific needs arising along the lecturing period.

SCENARIO 3. Non-classroom modality.
In the case the full non-classroom modality (discontinuation of all on-class learning and evaluation activities) is activated, the tools offered by the platforms currently available at University of Vigo -CAMPUS REMOTO and FAITIC- will be of preferent use. The specific conditions for the reo-organization to be carried out will depend of the particular time in the term in which such modality is mobilized. The following guidelines will be followed in the re-organization of the teaching activities:

a) Communication. All students in the course will be informed through the FAITIC teaching portal on the specific conditions for the development of the teaching and the evaluation activities that remain until the end of the term.

b) Adaptation and/or modification of the teaching methodologies. Even if the teaching methodologies for the course were fundamentally conceived towards the full-classroom modality, the teaching staff considers that they keep in essence their effectiveness in the non-classroom modality. That is why it is proposed to keep them as they are, even if special attention will be payed to their right development and results. Therefore, no changes will be made to the teaching methodologies initially defined for the course.

c) Adaptation of the tutorial and personalized attention to students. The tutorial sessions may be carried out by means of IT tools (email, video-call, FAITIC forums, etc.), according to the modality of prior concertation of the date and time for the session in the lecturers virtual offices.

d) Teaching contents and learning goals. There will be no changes neither in the contents to be taught nor in the learning goals, as a consequence of this teaching modality.

e) Teaching schedule. The class timetable and the calendar of the different activities in the course will be maintained as initially planned and scheduled.

f) Evaluation. No changes will be made neither to the evaluation tests, nor to their corresponding score weights, nor to their set dates.

g) Bibliography or additional materials to facilitate self-learning. The teaching staff for the course will provide the students with the necessary learning materials to attend to the specific help needs of the students with respect to the course, according to the circumstances that turn out at any particular time, through the FAITIC portal.

IDENTIFYING DATA				
Teoría de estruturas e construcións industriais				
Subject	Teoría de estruturas e construcións industriais			
Code	V12G380V01603			
Study programme	Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	3	2c
Teaching language	Castelán Galego			
Department	Enxeñaría dos materiais, mecánica aplicada e construción			
Coordinator	Caamaño Martínez, José Carlos Cabaleiro Núñez, Manuel			
Lecturers	Caamaño Martínez, José Carlos Cabaleiro Núñez, Manuel Conde Carnero, Borja de la Puente Crespo, Francisco Javier			
E-mail	jccaam@uvigo.es mcabaleiro@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	Nesta materia estudase o comportamento de estruturas e entramados de nudos tanto articulados como ríxidos, determinando as accións ás que están sometidas segundo a normativa, os esforzos, as tensións e as deformacións. Trátase de adquirir capacidade para converter unha estructura real nun modelo para a sua análise, e viceversa. Identifícanse as tipoloxías estruturais máis importantes utilizadas nas construcións en xeral, e nas industriais en particular.			

Competencias	
Code	
CG3	CG3 Coñecemento en materias básicas e tecnolóxicas que os capacite para a aprendizaxe de novos métodos e teorías, e os dote de versatilidade para adaptarse a novas situacións.
CG4	CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial na especialidade de Mecánica.
CG5	CG5 Coñecementos para a realización de medicións, cálculos, valoracións, taxacións, peritaxes, estudos, informes, planes de labores e outros traballos análogos.
CG6	CG6 Capacidade para o manexo de especificacións, regulamentos e normas de obrigado cumprimento.
CG11	CG11 Coñecemento, comprensión e capacidade para aplicar a lexislación necesaria no exercicio da profesión de Enxeñeiro Técnico Industrial.
CE23	CE23 Coñecementos e capacidade para o cálculo e deseño de estruturas e construcións industriais.
CT2	CT2 Resolución de problemas.
CT5	CT5 Xestión da información.
CT8	CT8 Toma de decisións.
CT9	CT9 Aplicar coñecementos.
CT10	CT10 Aprendizaxe e traballo autónomos.
CT17	CT17 Traballo en equipo.

Resultados de aprendizaxe			
Learning outcomes	Competences		
Coñecer os requisitos que deben reunir as estruturas para cumplir as súas funcións, tendo en conta as accións actuantes, os criterios de seguridade e as bases de cálculo. Adquirir capacidade para converter unha estrutura real nun modelo para o seu análise, e viceversa. Identificar as tipoloxías e elementos máis importantes que se utilizan nas estructuras e construccións industriais. Coñecer as condicións que rexen o comportamento das estruturas, nas súas diferentes tipoloxías. Capacidade para determinar as leis de esforzos, as tensións e as deformaciones nos elementos das estruturas.	CG3 CG4 CG5 CG6 CG11	CE23	CT2 CT5 CT8 CT9 CT10 CT17

Contidos
Topic

Introducción	Principios xerais Tipoloxías estruturais Tipos de análise estrutural
Accions	Clasificación Determinación de acciones sobre estructuras según normativa: gravitatorias, climáticas, térmicas e reolóxicas. Permanentes, variables, accidentais, empuxes, tráfico, depósitos e silos
Seguridade estrutural	Métodos de introducción da seguridade Estados límite últimos Estados límite de servicio Coeficientes de seguridade Combinación de accións
Tipoloxías estruturais e construccións industriais	Descrición das principais tipoloxías estruturais e elementos construtivos empregados
Estruturas reticulares de nudos articulados	Grado de hiperestaticidade. Criticidade. Sistemas isostáticos. Métodos de cálculo Sistemas hiperestáticos. Métodos de cálculo
Estructuras reticulares de nudos ríxidos	Definicións Orden de traslacionalidade Método de Cross - Estado fundamental - Estados paramétricos - Estado real
Cálculo matricial de estruturas	Definicións Matriz de rixidez. Coordenadas locais e globais. Ensamblaxe da matriz de rixidez Cálculo matricial de estruturas
Cálculo estrutural mediante elementos finitos	Introdución ó método Formulación Preproceso. Cálculo. Postproceso

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	32.5	49	81.5
Traballo tutelado	0	18.5	18.5
Prácticas de laboratorio	18	29	47
Exame de preguntas de desenvolvemento	3	0	3

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

Metodoloxía docente

	Description
Lección maxistral	Exposición dos contidos da materia, con apoio de pizarra e canón de vídeo
Traballo tutelado	Poxecto de cálcuo dunha estrutura
Prácticas de laboratorio	Actividades de aplicación dos coñecementos a situacións concretas e de adquisición de habilidades básicas e procedimentais relacionadas coa materia de estudo

Atención personalizada

Methodologies	Description
Lección maxistral	
Prácticas de laboratorio	
Traballo tutelado	

Avaliación

	Description	Qualification	Evaluated Competencess		
Traballo tutelado	Aos alumnos que teñan unha nota en exame maior ou igual ao 40% da cualificación máxima posible no mesmo, sumaráselles a nota obtida no traballo. Os traballos puntuaranse en función da súa calidade sobre unha nota máxima de 1 punto sobre 10.	10	CG3 CG4 CG5 CG6 CG11	CE23	CT2 CT5 CT8 CT9 CT10

Prácticas de laboratorio	Aos alumnos que obteñan alomenos 4'5 puntos sobre 10 na nota do exame, sumaranse 0'5 puntos adicionais se asistiron e participaron en todas as prácticas, e entregaron a documentación que se lles solicitou no seu caso nas mesmas. Adicionalmente, aos alumnos que cumpran os requisitos anteriores E QUE ADEMAIS ENTREGUEN TODOS OS PROBLEMAS PROPOSTOS PARA RESOLVER NA CASA, SUMARÁNSELLES OUTROS 0'5 PUNTOS Á NOTA.	10	CG3 CG4 CG5 CG6 CG11	CE23	CT2 CT5 CT8 CT9 CT10 CT17
Exame de preguntas de desenvolvemento	Exame escrito nas datas establecidas polo centro. O exame poderá estar dividido en partes de TEORÍA-NORMA e PROBLEMAS, así coma en bloques segundo o temario impartido. Poderá esixirse unha nota mínima en cada bloque ou parte do exame para calcular a nota media. Ponderación mínima do exame sobre a nota final:	80	CG3 CG4 CG5 CG6 CG11	CE23	CT2 CT5 CT8 CT9 CT10

Other comments on the Evaluation

Alumnos que renuncien oficialmente á evaluación continua

- Neste caso, a nota obtida no exame representará o 100% da cualificación.

Prácticas de laboratorio

- A parte presencial correspondente a cada práctica se realiza nunha data concreta, polo que non é posible recuperar as faltas de asistencia.
- Excusaranse puntual e excepcionalmente aquelas prácticas non realizadas nas que o alumno presente un xustificante oficial (médico, xulgado,...) debido a razóns inevitables de forza maior.

Resolución de problemas, taballos e exercicios de forma autónoma

- Os formatos de pesentación e a portada cos datos a incluir en cada entrega estarán disponibles na plataforma FAITIC/TEMA.
- Cada exercicio comezará páxina.
- Cada boletín será entregado coa portada normalizada con tódolos datos cubertos (número de boletín, nome do alumno, profesor de prácticas, grupo de prácticas).
- Non se permitirá a entrega de boletíns fora de prazo.
- Só se permitirá o grapado de follas para a copia en papel dos boletíns.

Bibliografía. Fontes de información

Basic Bibliography

Ministerio de Vivienda, **Código Técnico de la edificación**, www.codigotecnico.org,
Timoshenko & Young, **Teoría de las estructuras**,

Complementary Bibliography

Rodríguez Borlado, **Prontuario de estructuras metálicas**, CÉDEX,
Hibbeler, R., **Análisis estructural**, Prentice-Hall,
Calviño, X., **Apuntes sobre el método de Cross**,
Argüelles, R., **Cálculo de estructuras**,

Recomendacións

Subjects that it is recommended to have taken before

Resistencia de materiais/V12G380V01402
Elasticidade e ampliación de resistencia de materiais/V12G380V01502
Enxeñaría de materiais/V12G380V01504

Other comments

Requisitos: Para matricularse nesta materia é necesario ter superado ou ben estar matriculado de todas as materias dos cursos inferiores ao curso no que está emprazada esta materia.

Plan de Continxencias

Description

=== MEDIDAS EXCEPCIONAIS PLANIFICADAS ===
Ante a incerta e imprevisible evolución da alerta sanitaria provocada pola COVID- 19, a Universidade establece una planificación extraordinaria que se activará no momento en que as administracións e a propia institución o determinen atendendo a criterios de seguridade, saúde e responsabilidade, e garantindo a docencia nun escenario non presencial ou non totalmente presencial. Estas medidas xa planificadas garanten, no momento que sexa preceptivo, o desenvolvemento da docencia dun xeito mais áxil e eficaz ao ser coñecido de antemán (ou cunha ampla antelación) polo alumnado e o profesorado a través da ferramenta normalizada e institucionalizada das guías docentes DOCNET.

=== ADAPTACIÓN DAS METODOLOXÍAS ===
* Metodoloxías de ensino que se manteñen
Todas as metodoloxías de ensino mantéñense xa que poden desenvolverse mediante o uso da plataforma e campus de ensino remoto da Universidade de Vigo (Campus Remoto ou Integra e Faitic)
- Lección maxistral
- Traballo tutelado (aprendizaxe baseada en proxectos, para traballo colaborativo)
- Prácticas de laboratorio (só no caso da docencia en modalidade mixta)

* Metodoloxías de ensino que se modifican
En caso de non poder realizar prácticas de laboratorio presenciais que requiran a manipulación de equipos, poderán ser parcialmente substituídas por "Observación sistemática" realizando experimentos ou informes sobre estruturas ou elementos estruturais, que os estudantes poden realizar dende as súas casas.

* Mecanismo de servizo presencial para estudantes (titorías)
As titorías realizaranse por correo electrónico ao profesor da materia, quen poderá resolver as dúbidas por correo electrónico, ou convidar o alumno a participar nun titorial a través das ferramentas de teledoblación do Campus Remoto ou a aplicación de videoconferencia.

* Modificacións (se procede) do contido que se vai ensinar
Non se contemplan cambios nos contidos da materia

* Bibliografía adicional para facilitar a autoaprendizaxe
Ofreceranse notas detalladas para completar o material de apoio presentado nas clases impartidas a través do Campus Remoto.

* Outras modificacións

=== ADAPTACIÓN DA AVALIACIÓN ===
* Evidencia modificada
(1) Prácticas de laboratorio. Aos estudantes que obteñan polo menos 4,5 puntos sobre 10 na nota do exame, engadiranse 0,5 puntos adicionais se asistiron e participaron en todas as prácticas e entregaron a documentación solicitada no seu caso en o mesmo: [Peso anterior incluído nun 10% coa entrega de boletíns] -> [Peso proposto 5%]

(2) Resolución de problemas ou exercicios (boletíns). Para os estudantes que obteñan polo menos 4,5 puntos sobre 10 na nota do exame, e que tamén resolvan todos os problemas propostos (boletíns): [Peso anterior incluído nun 10% coa entrega de boletíns] -> [Peso 5% proposta]

(3) Traballo tutelado / Aprendizaxe baseada en proxectos (traballo colaborativo). Os estudantes que teñan unha nota superior ou igual ao 40% dos puntos posibles entre as seccións (4) e (5) a continuación, engadirase a nota obtida no traballo (entre 0 e 1 puntos sobre 10): [Peso 10% anterior] -> [Peso proposto 10%]

(4) Cuestións teóricas / normativas no exame final -> Cuestionarios teóricos. Cuestionarios para teoría, normativas e / ou preguntas de aplicación a exercicios de resposta curta [Peso anterior correspondente á parte teórica incluída no 80% do exame] -> [Peso proposto: 30%]

(5) Exame final (parte da resolución de problemas) -> Proba de resolución de problemas electrónica en caso de docencia non presencial [Peso anterior correspondente á parte de problemas incluída no 80% do exame] -> [Peso proposto: 50%]
Enviar comentarios
Historial
Guardadas
Comunidad

IDENTIFYING DATA				
Manufacturing engineering and dimensional quality				
Subject	Manufacturing engineering and dimensional quality			
Code	V12G380V01604			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	3rd	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Peláez Lourido, Gustavo Carlos			
Lecturers	Peláez Lourido, Gustavo Carlos Pérez García, José Antonio			
E-mail	gupelaez@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	First subject of non-generalist curricular content of a student of UVigo in the school of industrial engineering within the degree in mechanical engineering in the area of engineering of manufacturing processes. English Friendly			

Competencies	
Code	
CG3	CG3 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.
CG8	CG8 Ability to apply the principles and methods of quality.
CE26	CE26 Applied knowledge of systems and manufacturing processes, metrology and quality control.
CT2	CT2 Problems resolution.
CT8	CT8 Decision making.
CT9	CT9 Apply knowledge.
CT10	CT10 Self learning and work.
CT17	CT17 Working as a team.
CT20	CT20 Ability to communicate with people not expert in the field.

Learning outcomes	Competences		
(*)	CG3		CT2 CT8 CT9 CT10 CT17 CT20
New	CG3		CT2 CT8 CT9 CT10 CT20
New	CG3 CG8	CE26	CT2 CT8 CT9 CT10 CT20
New	CG3 CG8	CE26	CT8 CT9 CT10
New	CG3 CG8	CE26	CT2 CT8 CT9 CT10 CT17 CT20

Contents

Topic	
0.- Introduction	1. Introduction to the Industrial Production
1.- Manufacturing Engineering	2. Modelling and simulation of processes of mechanical manufacture 3. Analysis, implantation and optimisation of shaping processes 4. Lines and Systems of Mechanical manufacture and its simulation: CAM Systems Transfer Systems . Productio Lines, Manufactruing Flexible Cell & Systems. Integrated Manufacturing. 5. Process Planning: Analysis of the design drawings. Selection of processes and determination of the manufacturing sequence. Process plan definition. Technological management of manufacturing.
2.- Dimensional Quality	6. The field of dimensional metrology. Precision in industry. Measurement errors. Measuring chains 7. Mechanical Manufacturing inspection and verification systems, machines and equipment. 8. Modelling and measurement of surface quality 9. Calibration. The metrological organization. Measurement uncertainty. Traceability and dissemination. Calibration Plan. 10. Statistical control of the process. Graphs of control by variables. Graphs of control by attributes. Machine and process capacity. 11. Quality of measurements in industry. Measurement quality evaluation. Tools and techniques to evaluate dimensional quality and its costs. 12. Techniques and metrological systems. Legal and industrial metrology.

Planning			
	Class hours	Hours outside the classroom	Total hours
Laboratory practical	6	3	9
Practices through ICT	12	6	18
Lecturing	30	60	90
Objective questions exam	1	10	11
Report of practices, practicum and external practices	0	5.5	5.5
Problem and/or exercise solving	1.5	15	16.5
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Laboratory practical	The practical laboratory classes will be carried out in groups of 20 students maximum, and using the available resources of machines, equipment and instruments, combined with simulations and analysis carried out by computer within the practices in computer classrooms. Note: Due to the budget allocated to the area of manufacturing process engineering, laboratory practices may have to be replaced by slate problem solving classes if there are not sufficient or adequate means.
Practices through ICT	The practices in computer rooms will be carried out in groups of 20 students maximum and using the available resources of equipment and software, combining them with the workshop experiences of the laboratory practices. Note: If the request for renewal of the "Production Module" software is not met due to lack of budget, the practices related to this software may be replaced by problem solving classes on the blackboard. Translated with www.DeepL.com/Translator
Lecturing	Theoretical classes will be given combining whiteboard explanations with the use of slides, videos and computer presentations. The objective is to complement the content of the notes, interpreting the concepts exposed in them through the representation of examples and exercises.

Personalized assistance	
Methodologies	**Description**
Laboratory practical	The development of each practice is individually monitored, checking that the expected achievements are adequate in each execution phase so that the evolution in learning is structured. The deliverables are evaluated individually and the student is informed, where appropriate, of the shortcomings and needs for rectification of the documents or files requested.

Practices through ICT	The development of each practice is individually monitored, checking that the expected achievements are adequate in each execution phase so that the evolution in learning is structured. The deliverables are evaluated individually and the student is informed, where appropriate, of the shortcomings and needs for rectification of the documents or files requested.

Tests	**Description**
Objective questions exam	The competencies acquired are evaluated through a multiple-choice test, described in detail in the evaluation section
Report of practices, practicum and external practices	The deliverables are evaluated individually and the student is informed, where appropriate, of the shortcomings and needs for rectification of the documents or files requested.
Problem and/or exercise solving	The competencies acquired are evaluated individually through a written test of problem solving and/or exercises, described in the section of evaluation.

Assessment

	Description	Qualification	Evaluated Competencess		
Objective questions exam	This proof values the knowledges got in the classes of classroom and of practices and the personal work of the student to these associated. Results of learning: - Know the technological base and basic appearances of the processes of manufacture. - Understand the principles of the manufacturing systems - Get skills for the selection of manufacturing processes and know haw to make a manufacturing process planning - Apply CAQ technologies	25	CG3 CG8	CE26	CT2 CT8 CT9 CT10 CT17 CT20
Report of practices, practicum and external practices	In this proof include the reports or memories of practices and the exercises proposed in the classes of Classroom that will serve for the continuous evaluation, only if the student opts by this type of evaluation and whenever it was in the first call, such as it explains in the section other comments. Results of learning: - Get skills for the selection of processes of manufacture and preparation of the planning of manufacture - Develop skills for the manufacture of groups and elements in surroundings CADCAM - Apply CAQ technologies	20	CG3 CG8	CE26	CT2 CT8 CT9 CT10 CT17 CT20
Problem and/or exercise solving	Objective proofs of evaluation of the process of learning through the approach of problems and/or exercises of application so that the student develop of theoretical form-practical suitable solutions to each problem and/or exercise posed. Results of learning: - Know the technological base and principles of the processes of manufacture - Get skills for the selection of manufacturing processes and know how to make a manufacturing process planning. - Know how to apply CAQ technologies	55	CG3 CG8	CE26	CT2 CT8 CT9 CT10 CT17 CT20

Other comments on the Evaluation

Ethical commitment: The student is expected to exhibit appropriate ethical behavior. If unethical behavior is detected (copying, plagiarism, use of unauthorized electronic devices, for example), the student will not be considered to meet the requirements necessary to pass the subject. In this case, the overall grade for the current academic year will be a fail (0.0).The use of any electronic device will not be allowed during the evaluation tests unless expressly authorized. The fact of introducing an unauthorized electronic device in the examination room will be considered as a reason for not passing the subject in the present academic year and the overall grade will be of fail (0.0).

FIRST CALL:

Students can choose between two evaluation systems:

A. Without Continuous Assessment The assessment is based on a Final Exam consisting of two parts (a+b):

a. Test of up to 20 questions, which can be both classroom teaching and practice. The test will be made up of multiple choice and single answer questions in which each wrong answer subtracts the probability of guessing (i.e. if there are four possible answers, the error would subtract 1/4 from the value of the question). The value of the test is 35% of the test.

b.- Problems and/or exercises that can be both classroom teaching and practical. The value of this part of the exam is 65%.

B. Continuous Evaluation. It consists of two parts:

a.- Examination (8 points out of 10 of the total of the subject) that consists of two parts:

Questionnaire Test (2,5) points out of 8 of the total of the examination) of a maximum of 20 questions, which may be from the part of classroom teaching or practice. The test questions may include closed-ended questions with different alternative answers (true/false, multiple choice, pairing of elements,...). Each wrong answer of the test will subtract the probability of right (i.e. if there are four possible answers and a single answer would subtract 1/4 of the value of the question, and in an equivalent way to the other types of questions of the test).

Problem solving and/or exercises (5.5 points out of 8 of the total of the exam), which may be from the classroom teaching or practice part.
b.- Justification of Practices through memory or report (2 points out of 10 of the total of the subject) To pass the subject a minimum grade of 40% must be obtained in each evaluable part, that is to say: For case A: a minimum of 4 must be obtained in the test as well as in the part of problems if each one of those parts of the exam is evaluated on 10. If this minimum is not passed in each part, the student will not be able to obtain more than 4.9 in the final overall grade. For case B: a minimum grade of 4 must be obtained in each of the three evaluable parts: practices, test and problems/exercises. If the student does not reach the minimum of 4 out of 10 in each evaluable part he will not be able to obtain more than 4.9 in the global final grade of all the subject.

SECOND AND SUBSEQUENT CALLS: In the second call and in subsequent calls, in this latter case in which the teaching given in the immediately preceding course is evaluated, the Evaluation System is limited only to option A of those explained in the case of First Call. In no case will any part of the subject or content evaluated in previous courses be recognized.

Sources of information

Basic Bibliography

Serope Kalpakjian, Steven R. Schmid, **Manufactura, ingeniería y tecnología**, 7ª, Pearson Education, 2014

Complementary Bibliography

Alting, Leo, **Procesos para Ingeniería de Manufactura**, 1ª, Alfaomega, 1990
Todd, Robert H., **Fundamental principles of manufacturing processes**, 1ª, Industrial Press, 1994
Pfeifer, Tilo, **Manual de gestión e ingeniería de la calidad**, 1ª ed. español, Mira Editores, 1999
Barrentine, Larry, **Concepts for R&R studies**, 2nd., ASQ Quality Press, 2003
William F. Hosford and Robert M. Caddell, **Metal forming : mechanics and metallurgy**, 2nd., Prentice Hall, 1993

Recommendations

Subjects that continue the syllabus

Materials and technologies in mechanical manufacturing/V12G380V01912
Materials selection, tools and manufacturing resources/V12G380V01932
Advanced manufacturing technologies/V12G380V01935

Subjects that it is recommended to have taken before

Graphic expression: Graphic expression/V12G380V01101
Fundamentals of manufacturing systems and technologies/V12G380V01305
Resistance of materials/V12G380V01402

Other comments

Use of FAITIC for the follow-up of the Continuous Evaluation.
Communications with students will be made through the Faitic Remote Teaching Platform, so it is necessary for the student to access the subject space on the platform prior to the start of teaching. Before carrying out the practices for carrying out the practices, problem solving and/or exercises, it is recommended to consult the FAITIC Platform in order to have regulations, manuals or any other necessary material that should specifically be used and/or allowed.

The student who accedes to third of the degree of mechanics, and concretely to this matter, should at this level have minimum capacity for:
- Use measurement instruments and dimensional verification in the laboratory/workshop.
- Use statistics in Quality Control.

- To delimit and define tolerances in an adequate and precise way to mechanical elements.
- Representation of basic parts and assemblies by means of 3D CAD
- Use and know the manual machine tools and their basic operations.
- Elborar basic NC programs on lathe and milling machine, and select the tools.
- Plan machining, deformation and welding processes to produce basic parts and/or assemblies.
- Apply the theory of Elasticity and know how to represent stress states through Mohr circles.
If the student accesses without these competences, he will not be able to have an optimal learning process and he will need a longer time for the acquisition and updating in his capacities so that the final formation is the expected one.

In order to enroll in this subject it is necessary to have passed or to be enrolled in all the subjects of the courses lower than the course in which this subject is located.

Contingency plan

Description

=== EXCEPTIONAL MEASURES SCHEDULED ===
In front of the uncertain and unpredictable evolution of the sanitary alert caused by the *COVID-19, the University of Vigo establishes an extraordinary planning that will activate in the moment in that the administrations and the own institution determine it attending to criteria of security, health and responsibility, and guaranteeing the teaching in a no face-to-face stage or partially face-to-face. These already scheduled measures guarantee, in the moment that was prescriptive, the development of the teaching of a more agile and effective way when being known in advance (or with a wide *antelación) by the students and the *profesorado through the tool normalised and institutionalised of the educational guides.

=== ADAPTATION OF THE METHODOLOGIES ===
will adapt to the telematic means that put to disposal of the *profesorado, in addition to the documentation facilitated through *FAITIC, email and Remote Campus.
They will include , to be the case, methodologies that *substituyan to the planned by others of type no face-to-face like works *tutelados of autonomous form.

* Educational methodologies that keep
- Practical with support of the TIC
- Lesson *Magistral

* educational Methodologies that modify
delete Practise "them of Laboratory" that will be *substituidas by "Work *tutelado" and "Resolution of problems of autonomous form".

* Mechanism no face-to-face of attention to the students (*tutorías)
The *tutorías will be able to develop of face-to-face form (whenever it was possible to guarantee the sanitary measures) or telematic (email, remote campus or forums of *FAITIC) under the modality of *concertación previous. It will do a *adecuación methodological to the students of risk, facilitating him additional specific information, to accredit that it can not have access to the contents given of conventional form.

* Modifications (if they proceed) of the contents to give
do not proceed

* additional Bibliography to facilitate the car-learning
will be able to recommend along the course to facilitate the tasks of car-*aprendiizaje in necessary case.

* Other modifications

=== ADAPTATION OF THE EVALUATION ===
In the measure of the possible, will keep the face-to-face proofs adapting them to the valid sanitary rule. The proofs will develop of face-to-face form except Resolution *Rectoral that indicate that they have to do of form no face-to-face, making of this form through the distinct tools put to disposal of the *profesorado. Those no attainable proofs of telematic form *suplirán by other (deliveries of autonomous work guided, etc.)

To continuation establish the modifications in the weights of assessment of each methodology or proof, following the *recomendacións given by the *UVigo in front of the situation of sanitary and possible emergency confinement.

* Proofs that keep
To.- In the case to choose WITHOUT Continuous Evaluation there are not changes in the proofs neither in his percentages of

weighting

*B.- With Continuous Evaluation and First Opportunity
Examination of objective questions: [previous Weight 25%] [Weight Proposed 12,5%]
Report of practices and Exercises proposed in the Classroom : [20%] [60%]
Resolution of problems and/or exercises: [55%] [27,5%]

In the second *portunidad and back the percentages correspond with the ones of the case To (Without Continuous Evaluation).
...

* Proofs that modify
does not proceed

* New proofs
does not proceed

* additional Information

IDENTIFYING DATA				
Technical Office				
Subject	Technical Office			
Code	V12G380V01701			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	4th	1st 2nd
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Bouza Rodríguez, José Benito Cerqueiro Pequeño, Jorge			
Lecturers	Bouza Rodríguez, José Benito Comesaña Campos, Alberto Corralo Domonte, Francisco Javier			
E-mail	jcerquei@uvigo.es jbouza@uvigo.es			
Web				
General description	The aim pursued with this course is to guide the student in the acquisition of the knowledge and the skills needed to qualify him for the handling and application of the methodologies, techniques and tools oriented to the elaboration, organisation and management of projects and another technical documentation regularly used in Engineering Offices, in ways that prepare the student to make use of these skills to carry out similar activities in his future professional activity in the real world. In order to achieve that goal, the course uses a broad approach of the subjects in its contents, looking for the integration of the knowledge achieved along the student□s previous courses and its application through the methodology, organisation and management of several different modalities of technical works, as they constitute the true essence of the Engineer profession in the framework of his professional competences and fields of activity. This course promotes the development of its associated skills by means of using active and technical collaborative methodologies. In this way, the contents explained in theoretical classes are implemented and developed in the practical activities -oriented to the industrial reality of the profession-, thus assimilating the agile and precise use of the different rules of application and of the professional best practices established, while being supported by the new technologies to document, elaborate, manage and present the technical documentation that correspond to each particular case.			

Competencies	
Code	
CG1	CG1 Skills for writing, signing and developing projects in the field of industrial engineering, whose purpose, specializing in Mechanics, construction, alteration, repair, maintenance, demolition, manufacturing, installation, assembly or operation of: structures, mechanical equipments, energy facilities, electrical systems and electronic installations and industrial plants, and manufacturing processes and automation.
CG2	CG2 Ability to manage the activities object of the engineering projects described in CG1.
CE18	CE18 Knowledge and skills to organize and manage projects. Know the organizational structure and functions of a project office.
CT1	CT1 Analysis and synthesis
CT2	CT2 Problems resolution.
CT3	CT3 Oral and written proficiency.
CT5	CT5 Information Management.
CT6	CT6 Application of computer science in the field of study.
CT7	CT7 Ability to organize and plan.
CT8	CT8 Decision making.
CT9	CT9 Apply knowledge.
CT10	CT10 Self learning and work.
CT11	CT11 Ability to understand the meaning and application of the gender perspective in the different fields of knowledge and professional practice with the aim of achieving a more just and egalitarian society.
CT12	CT12 Research skills.
CT13	CT13 Ability to communicate orally and in writing in the Galician language.
CT14	CT14 Creativity.
CT15	CT15 Objectification, identification and organization.
CT16	CT16 Critical thinking.
CT17	CT17 Working as a team.
CT20	CT20 Ability to communicate with people not expert in the field.

Learning outcomes			
Learning outcomes	Competences		
New	CG1 CG2	CE18	CT1 CT3 CT5 CT6 CT7 CT8 CT9 CT11 CT14 CT15 CT16 CT17 CT20
New		CE18	CT1 CT2 CT3 CT5 CT6 CT9 CT10 CT12 CT13 CT15
New	CG1		CT1 CT3 CT5 CT20
New	CG2	CE18	CT1 CT5 CT7 CT8 CT17 CT20
New	CG1		CT3 CT20

Contents	
Topic	
1. Introduction and presentation of the course.	1.1. Presentation. 1.2. Learning guide for the course. 1.3. Criteria and norms for the development of the course. 1.4. Professional and legal aspects.
2. The Engineering Office.	2.1. Introduction to the industrial Engineering office. 2.2. Realisations of the Engineering office. 2.3. Infrastructure of an Engineering office. 2.4. Organisation and management of an Engineering office.
3. Technical reports and similar works.	3.1. Technical reports. 3.2. Assessments, valuations and budgets. 3.3. Other similar technical works. 3.4. Criteria and norms for the editorial and presentation of technical works.
4. The Project methodology.	4.1. Introduction. 4.2. Theories on the Project. 4.3. Methodology of the Project process. 4.4. The phases of the industrial Project.
5. The normative and legal frame of the Project.	5.1. The legal regulations and the Project. 5.2. Specific technical regulations. 5.3. Normalisation, certification, homologation and quality. 5.4. Patent rights and transfer of technology.
6. Documentation in the industrial Project.	6.1. Memory. 6.2. Plans. 6.3. Specifications. 6.4. Measurements and Budget. 6.5. Studies with their own entity.

7. Methods and techniques for the organisation and management of Projects.	7.1. Organisation, direction and coordination of Projects. 7.2. Methods and techniques for the management of Projects. 7.3. Techniques for the optimisation of Projects. 7.4. Tools for the computer-assisted management of Projects.
8. Processing of Projects and of another technical documentation.	8.1. Criteria and norms for the processing of Projects. 8.2. Process for the certification of Projects and other technical documents. 8.3. Management of licences, permissions and authorisations before public and private institutions. 8.4. Bidding and contracting of Projects.
9. Engineering Supervision of industrial projects.	9.1. Professionals that take part in the materialization of projects. 9.2. Functions and activities of the Engineering or Work Supervision. 9.3. Legal frame that regulates the functions and responsibilities of the Engineering Supervision. 9.4. Obligations of the Engineering Supervision in matters of health and Security at work.
Assignment 1. Study and analysis of a project related with the speciality.	The students, either on individually or in groups, will look for a project documentation to study and analyse it, and on which they will elaborate a Technical Report. This Report will contain at least: an assessment of the main aspects that on the view of the student stand out in the project, the description of the project's structure, contents, arrangement and presentation of its documents, as well as its adaptation to the contents of the UNE 157001:2014 standard. The analysis will take into account, among others, the treatment in the project of the social, health and security, environmental, economic and industrial aspects, as well as the level of usage of suitable project methods.
Assignment 2. Realisation of a technical proposal for preparation of a project related with the speciality.	The students will be arranged in groups of three to five members, and they will draft an offer of professional services addressed to a fictional petitioner (internal or external promoter) containing at least the following: the project approach, work methodology to be followed for his elaboration, and description of the material resources and humans that are necessary. This proposal will also address the social, health and security, environmental, economic and industrial aspects. It will promote too that the solutions proposed make use of some avant-garde knowledge in the specific field of engineering.
Assignment 3. Elaboration of the documents of a simple project.	The students, arranged in groups of three to five members, will develop, according to its level of difficulty, the documentation for the preliminary draft or of a detail projectl. It will be required to do a presentation and defence of the work. The students will select and apply appropriate project methods according to the project goals and to the specific technological discipline. In the frame of the development of these documents, the students will have to resort to bibliographic researches, query and use of databases and other sources of information, as well as carrying out specific simulations and analyses of the engineering field.
Assignment 4. Elaborate a basic planning/scheduling for the execution of the previously elaborated project.	Supported by the project management methods and tools, each student team will elaborate the planning and scheduling for the execution of the works in the previously elaborated project, making use of appropriate methodologies according to the posed goals and to the technological discipline tackled.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	26	40	66
Project based learning	24	48	72
Project based learning	0	6	6
Problem and/or exercise solving	4	0	4
Report of practices, practicum and external practices	0	2	2

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

Methodologies

	Description
Lecturing	The theoretical contents will be presented by the lecturer, complemented with the active intervention of the students, and in total coordination with in the development of the practical activities programmed.
Project based learning	Realisation of an interdisciplinary project resembling a real case with the students arranged in groups, requesting active participation of all members, and with the guidance of the lecturer.

Project based learning	Realisation of an interdisciplinary project resembling a real case with the students arranged in groups, requesting active participation of all members, and with the guidance of the lecturer.

Personalized assistance

Methodologies	Description
Project based learning	Proposition and review of the outcomes of the course activities, aiming to support individually the learning process in small groups of students.

Assessment

	Description	Qualification	Evaluated Competencess		
Problem and/or exercise solving	A series of proofs for knowledge assessment will take place along the term for the student's evaluation. The extension of the proof will depend on the specific topics to be assessed.	50	CG1	CE18	CT1 CT5 CT6 CT8 CT11 CT13 CT14 CT15 CT16
Report of practices, practicum and external practices	Along the term, the students will elaborate a series of reports of their practical activities, to be delivered to the lecturer for their continuous evaluation. The implication of the student in the classes and in the realisation of the diverse activities programmed will be taken into account, as well as the compliance of the sumbission terms, and/or the presentation and defence of the works carried out.	50	CG1 CG2	CE18	CT1 CT2 CT3 CT5 CT6 CT7 CT8 CT9 CT10 CT14 CT15 CT17 CT20

Other comments on the Evaluation

In the 'continuous evaluation' modality, the students will pass the course if they reach a score of 5.0 points, with no need to attend the proof in the official date. A minimum score of 50% of the maximum grade is required for each part and section. The 'continuous evaluation' will consolidate the partial marks, and the students are required to do again -both in the May and July official dates- only the failed parts across the continuous evaluation process. Students wishing to improve their continuous -pass- evaluation grade can do the full official final exam as well. The students that failed the course in the first official date must do a final test that will encompass the whole of the -theory and practiical- course contents, that might include short- and long-answer tests, problem-solving and case study development. An appropriate ethical behaviour is expected from the student. In the case that a non-ethical -copying, plagiarism, use of unauthorized electronic devices, among others- it will be considered that the student does not meet the necessary requirements to pass the course. In this case the overall grade for the course in the present academic year will be a fail (0.0). Except in the case of specific authorization, no electronic devices will be allowed for the students to use during the evaluation tests. The act of being in posession of a non-authorized device while in the exam room will be taken as a cause for not passing the course in the current academic year, and the overall grade will be a fail (0.0).

Sources of information

Basic Bibliography

Brusola Simón, Fernando, **OFICINA TÉCNICA Y PROYECTOS**, Servicio Publicaciones Universidad Pol. Valencia, 2011

De Cos Castillo, Manuel, **TEORIA GENERAL DEL PROYECTO I: GESTIÓN DE PROYECTOS**, Síntesis, 1995

De Cos Castillo, Manuel, **TEORIA GENERAL DEL PROYECTO II: INGENIERIA DE PROYECTOS**, Síntesis, 1997

Complementary Bibliography

Díaz Martín, Ángel, **EL ARTE DE DIRIGIR PROYECTOS**, 3ª, RA-MA, D.L., 2010

Gómez-Senent Martínez, Eliseo; González Cruz, Mª Carmen, **TEORÍA Y METODOLOGÍA DEL PROYECTO**, Servicio Publicaciones Universidad Pol. Valencia, 2008

Martínez de Pisón Ascacíbar, Francisco Javier, et al., **LA OFICINA TÉCNICA Y LOS PROYECTOS INDUSTRIALES**, Asociación Española de Ingeniería de Proyectos, 2002

Santos Sabrás, Fernando, **INGENIERÍA DE PROYECTOS**, 2ª, Eunsa, 2002

Serer Figueroa, Marcos, **GESTIÓN INTEGRADA DE PROYECTOS**, 3ª, Ediciones UPC, 2010

Recommendations

Subjects that continue the syllabus

Final Year Dissertation/V12G380V01991

Subjects that it is recommended to have taken before

Graphic expression: Graphic expression/V12G380V01101
Graphic engineering/V12G380V01602

Other comments

To register in this course, the students are required to have passed, or at least are registered in, all the courses from previous years to the one this course is placed on. It is necessary to stress the importance of having passed the two courses indicated in the previous section before taking this course.

In case there are any discrepancies, the version in Spanish of this guide will prevail.

Contingency plan

Description

=== EXCEPTIONAL MEASURES SCHEDULED ===
In front of the uncertain and unpredictable evolution of the sanitary alert caused by the COVID-19, the University of Vigo establishes an extraordinary planning that will be activated at the moment in which the administrations and the own institution deemed it necessary accordingn to criteria of security, health and responsibility, and guaranteeing the teaching in a no face-to-face or partially face-to-face stages. These already scheduled measures guarantee, in the moment that they are prescribed, the development of the teaching in a more agile and effective way when known in advance (or with a wide anticipation) by the students and the teaching staff through the normalised and institutionalised educational guides tool.

=== ADAPTATION OF THE METHODOLOGIES ===
* Educational Methodologies to keep:
There are no changes.
* Educational Methodologies to be modified:
There are no changes.
* Mechanisms for not face-to-face of attention to the students (tutorial sessions):
Will be made through telematic means: virtual rooms, email, telephone, etc.
* Modifications (if appies) of the contents to be taught:
There are no changes.
* Additional Bibliography to facilitate the home-learning:
There are no changes.
* Other modifications:
There are no changes.

=== ADAPTATION OF THE EVALUATION ===
* Tests already done:
Resolution of problems and/or exercises: [Previous Weight 50%] [Weight Proposed 50%]
Laboratory assignment reports: [Previous Weight 50%] [Weight Proposed 50%]
...

* Pending tests to be kept:
Resolution of problems and/or exercises: [Previous Weight 50%] [Weight Proposed 20%]
Laboratory assignment reports: [Previous Weight 50%] [Weight Proposed 80%]
...

* Tests to be modified:
None.

* New tests:
None.

* Additional Information
Regarding the contents of the initial Learning guide, the following changes are made:
The sentence 'it is demanded to achieve a minimum of 50% of the maximum
grade in each part and each sub-part' is suppressed.

The expression 'and it will be possible to make this test by telematic means as well as in writing or in oral form' is inserted in the following sentence, that states now 'and that it will be possible to include short- or long-answer tests, problem-solving tests or development of case studies, and it will be possible to make this test by telematic means as well as in writing or in oral form'.

IDENTIFYING DATA				
Compoñentes eléctricos en vehículos				
Subject	Compoñentes eléctricos en vehículos			
Code	V12G380V01902			
Study programme	Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	4	2c
Teaching language	Castelán			
Department	Enxeñaría eléctrica			
Coordinator	López Fernández, Xosé Manuel			
Lecturers	López Fernández, Xosé Manuel			
E-mail	xmlopez@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description				

Competencias	
Code	
CG3	CG3 Coñecemento en materias básicas e tecnolóxicas que os capacite para a aprendizaxe de novos métodos e teorías, e os dote de versatilidade para adaptarse a novas situacións.
CT3	CT3 Comunicación oral e escrita de coñecementos.
CT5	CT5 Xestión da información.
CT10	CT10 Aprendizaxe e traballo autónomos.
CT17	CT17 Traballo en equipo.

Resultados de aprendizaxe		
Learning outcomes		Competences
Transmitir os conceptos básicos de carácter innovador que representa a incorporación de compoñentes eléctricos nos vehículos.	CG3	CT3 CT5 CT10 CT17
Ofrecer ao alumno unha visión da evolución tecnolóxica e retos futuros no relativo aos compoñentes eléctricos e ás distintas solucións da rede eléctrica de abordo nos vehículos	CG3	CT3 CT5 CT10 CT17
Matizar as características de funcionamento dos distintos compoñentes eléctricos, así como as diferentes configuracións da instalación eléctrica que incorpora o automóbil.	CG3	CT3 CT5 CT10 CT17

Contidos	
Topic	
Introdución.	Introdución. Tipos de vehículo. Historia do vehículo eléctrico. Perspectivas de futuro.
Esquemas eléctricos en vehículos.	Introducción. Instalación eléctrica. Esquemas eléctricos. Localización dos compoñentes eléctricos no esquema eléctrico. Principais circuítos que compoñen o esquema.
Compoñentes eléctricos de abordo.	Introducción. Sistemas eléctricos principais. Sistemas eléctricos auxiliares. Accionamiento. Tracción. Dispositivos auxiliares. Equipos de abordo. Sensores.

Tracción en vehículos eléctricos.	Introdución. Requisitos para a tracción eléctrica. Motor asíncrono. Motor síncrono. Motor de reluctancia. Motor de imáns permanentes. Control e accionamento. Aplicacións.
Sistemas de control e comunicación.	Introdución. Sistemas de comunicación: Elementos; Configuracións; Buses Sistemas de control: Estáticos; Dinámicos; Seguridade; Motor
Sistemas de almacenamento de enerxía.	Introducción. Baterías. Células de combustión. Supercondensadores. Volante de inercia Tendencias. Integración na red eléctrica
Sistemas de recarga e infraestrutura de soporte.	Introducción. Modos de recarga. Tipos de conectores. Infraestructura de soporte. Tipos de redes de alimentación. Enerxías alternativas. Arquitectura de un xestor de carga. Redes intelixentes.
Prácticas de laboratorio	Achegamento aos diferentes compoñentes eléctricos, análises e identificación dos mesmos.

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	12	36	48
Saídas de estudo	10	10	20
Traballo tutelado	10	30	40
Presentación	10	32	42

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

Metodoloxía docente

	Description
Lección maxistral	Exposición dos núcleos dos temas, seguida da explicación conveniente para favorecer a súa comprensión. Motivación do interese polo coñecemento da materia.
Saídas de estudo	Coñecemento dos procesos de fabricación de compoñentes relacionados coa materia e a súa diferenciación dentro do sector.
Traballo tutelado	Profundización no contido detallado da materia adoptando un enfoque estruturado e de rigor. Promover o debate e a confrontación de ideas.
Presentación	Exercitar recursos de análises e sínteses dos traballos tutelados elaborados. Promover a adopción de aptitudes autocríticas e a aceptación de enfoques contrarios.

Atención personalizada

Methodologies	Description
Saídas de estudo	
Traballo tutelado	
Presentación	

Avaliación

Description	Qualification	Evaluated Competencess

Traballo tutelado	Valoración dos traballos individuais e en equipo, materializados nunha memoria.	60	CG3	CT3 CT5 CT10 CT17
Presentación	Presentación individual dos resultados dos traballos tutelados, onde se puntuará: Motivación polo tema. Claridade da exposición. Medios utilizados. Resposta ás dúbidas e suxestións presentadas. Claridade de conceptos Precisión da información Achegas Resultados Conclusións	40	CG3	CT3 CT5 CT10 CT17

Other comments on the Evaluation

El alumno/a podrá escoger entre una de las dos opciones, Opción A (Evaluación Final) o Opción B (Evaluación continua), para su evaluación, según se detalla a continuación. Opción A A esta Opción A podrá optar cualquier alumno/a matriculado/a en la asignatura. La evaluación de los conocimientos adquiridos por el alumno/a se hará de forma individual, y sin la utilización de ningún tipo de fuente de información, en un único examen escrito que englobará toda la materia recogida en el Temario relativa al Aula, Laboratorio y Salidas de estudios o Prácticas de campo. Los exámenes coincidirán con las convocatorias oficiales correspondientes. Para superar la asignatura, será necesario obtener una puntuación igual o superior al 50% de la puntuación asignada. Opción B A esta Opción B podrán optar sólo los alumnos/as que participen de forma presencial en todos los ejercicios y actividades que se propongan en el Aula, para realizar tanto de forma individual como en equipo, y que además asistan a todas y cada una de las actividades de Laboratorio y Salidas de estudio o Prácticas de campo programadas. Dichas actividades consistirán en: Trabajos tutelados individuales y en equipo, evaluados a través de una memoria escrita, con un peso de 60%. Presentaciones individuales y en equipo de los resultados de los trabajos tutelados, con un peso de 40%. Para superar la asignatura, es condición necesaria, pero no suficiente, obtener como mínimo el 30% de la nota máxima asignada a cada una de las partes, tanto en Trabajos tutelados (mínimo 2%), como en Presentaciones (mínimo 1,20%). La materia estará superada cuando la puntuación total (Trabajos tutelados + Presentaciones) resulta una nota final mínima del 50%. En aquellos casos en los que a pesar de no superar el 30% de la nota máxima asignada de alguna de las partes Trabajos tutelados y/o Presentaciones, resulte una nota igual o mayor al 50% requerido, la nota final se traducirá en un 30%, lo que significará un suspenso.

Compromiso ético: Espérase que o alumno presente un comportamento ético adecuado. No caso de detectar un comportamento non ético (copia, plaxio, utilización de aparellos electrónicos non autorizado, e outros) considérase que o alumno non reúne os requisitos necesarios para superar a materia. Neste caso a cualificación global no actual curso académico será de suspenso (0.0). Non se permitirá a utilización de ningún dispositivo electrónico durante as probas de avaliación salvo autorización expresa. O feito de introducir un dispositivo electrónico non autorizado na aula de exame será considerado motivo de non superación da materia no presente curso académico e a cualificación global será de suspenso (0.0).

Bibliografía. Fontes de información

Basic Bibliography

TOM DENTON, **AUTOMOBILE ELECTRICAL AND ELECTRONIC SYSTEMS**, THIRD EDITION, Elsevier Butterworth-Heinemann, 2004

Bosch, **Automotive Handbook**, 8th Edition

K. T. Chau, **ELECTRIC VEHICLE MACHINES AND DRIVES DESIGN, ANALYSIS AND APPLICATION**, 978-1-118-75252-4, 2015, Wiley,

Eli Emadi, **Advanced Electric Drive Vehicles**, 978-1-4665-9770-9, 2015, CRC Press Taylor & Francis Group,

William B. Ribbens, **Understanding Automotive Electronics. An Engineering Perspective**, 978-0-12-810434-7, Elsevier Inc., 2017

Complementary Bibliography

José Domínguez, Esteban, **Sistemas de Carga y arranque**, 2011,

Sánchez Fernández, Enrique, **Circuitos Eléctricos Auxiliares del Vehículo**, 2012,

Esteban José Domínguez y Julián Ferrer, **Circuitos eléctricos auxiliares del vehículo**, 2012,

Nicolas Navet, F. Simonot-Lion, **Automotive Embedded Systems Handbook**, 978-0-8493-8026-6, CRC Press Taylor & Francis Group, 2009

Bruno Scrosati, J. Garche, W. Tillmetz, **Advances in Battery Technologies for Electric Vehicles**, 978-1-78242-377-5, Elsevier Ltd., 2015

Recomendacións

Subjects that continue the syllabus

Traballo de Fin de Grao/V12G360V01991

Subjects that it is recommended to have taken before

Fundamentos de teoría de circuítos e máquinas eléctricas/V12G360V01302
Electrotecnia aplicada/V12G360V01501

Other comments

Para matricularse nesta materia é necesario superar ou ben estar matriculado de todas as materias dos cursos inferiores ao curso en que está situada esta materia.

En caso de discrepancia, prevalecerá a versión en castelán desta guía.

Plan de Continxencias

Description

No caso de que a asistencia presencial do alumnado ás clases estea legalmente limitada total ou parcialmente, adoptaranse as directrices sinaladas pola Universidade ou organismo competente, tendo que:
- Contido: Mantense.
- Planificación: Mantense.
- Metodoloxía: Emprego de medios acordes coas directrices da Universidade ou organismo competente.
- Atención personalizada: As sesións de *tutorización poderán realizarse por medios alternativos baixo a modalidade de concertación previa, e acorde coas directrices da Universidade ou organismo competente.
- Avaliación: Emprego de medios acorde coas directrices da Universidade ou organismo competente.
- Bibliografía: Non se modifica respecto da modalidade presencial.

IDENTIFYING DATA				
Technical English I				
Subject	Technical English I			
Code	V12G380V01903			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	English			
Department				
Coordinator				
Lecturers				
E-mail				
Web	http://moovi.uvigo.gal/			
General description	This course aims at providing students with a systematic adequacy to develop the appropriate skills for communicating in Technical English at level A2 according to the Common European Framework of Reference for Languages (CEFR). As far as possible, students will be monitored so as to accommodate to each individual needs.			

Competencies	
Code	
CG10	CG10 Ability to work in a multidisciplinary and multilingual environment.
CT1	CT1 Analysis and synthesis
CT4	CT4 Oral and written proficiency in a foreign language.
CT7	CT7 Ability to organize and plan.
CT10	CT10 Self learning and work.
CT17	CT17 Working as a team.
CT18	CT18 Working in an international context.

Learning outcomes	Competences	
To encourage students to use the English language within the engineering context, and the benefits and usefulness of the English language when applying their grammatical, lexical, and cultural knowledge.	CG10	CT1 CT4 CT7 CT10 CT17 CT18
To improve students' sense of linguistic awareness of English as a second language, the grammatical and lexical mechanisms and types of expressions.	CG10	CT1 CT4 CT7 CT10 CT17 CT18
Improving students' listening and reading skills, as well as their speaking and writing skills.	CG10	CT1 CT4 CT7 CT10 CT17 CT18
To upgrade students' grammatical and lexical notions of the English language, and the comprehension of basic Technical English structures.	CG10	CT1 CT4 CT7 CT10 CT17 CT18
Promoting students' critical autonomy for the comprehension and understanding of texts, dialogues and oral presentations.	CG10	CT1 CT4 CT7 CT10 CT17 CT18

Contents

Topic	
1. English grammar	UNIT 1
2. Vocabulary/Use of English	Reading: Batteries and Flowbatteries.
3. Technical-scientific language	Reading: Parts of a car.
4. Speaking	Speaking: Describing components and materials.
5. Listening	Speaking: Dates, mathematical expressions, web sites and email
6. Reading comprehension	addresses, chemical formula.
7. Writing	Listening: Where's that Darn Battery.
8. Direct and inverse translation of specific parts	Listening: Adsense Making Money Online.
of the discourse	Grammar: Present Simple.
1. English grammar	UNIT 2
2. Vocabulary/Use of English	Reading: CO2 and the Greenhouse Effect.
3. Technical-scientific language	Reading: Maintaining your Car.
4. Speaking	Speaking: Describing easy shapes and forms, and dimensions.
5. Listening	Listening: Light Pollution.
6. Reading comprehension	Listening: MIT Seeks Moral to the Story of Self-driving Cars.
7. Writing	Writing: Easy paragraph writing.
8. Direct and inverse translation of specific parts	Grammar: Passive voice.
of the discourse	
1. English grammar	UNIT 3
2. Vocabulary/Use of English	Reading: Job Qualities for an Engineer.
3. Technical-scientific language	Speaking: Expressing one own's qualities, and personal characteristics and
4. Speaking	abilities.
5. Listening	Listening: Mobile phones.
6. Reading comprehension	Grammar: Relative Clauses.
7. Writing	Writing: Dividing a text into types of paragraphs.
8. Direct and inverse translation of specific parts	
of the discourse	
1. English grammar	UNIT 4
2. Vocabulary/Use of English	Reading: Repairing a Broken Wall Socket.
3. Technical-scientific language	Speaking: Advantages and disadvantages of the different generation
4. Speaking	power systems.
5. Listening	Listening: How do Nuclear Power Plants work?
6. Reading comprehension	Writing: A report.
7. Writing	Grammar: Adverbs of sequence; conditional sentences; connectors:
8. Direct and inverse translation of specific parts	contrast, reason, purpose, and result.
of the discourse	
1. English grammar	UNIT 5
2. Vocabulary/Use of English	Reading: Windfarms.
3. Technical-scientific language	Speaking: Comparison and contrast.
4. Speaking	Listening: Manipulating Glass Properties.
5. Listening	Listening: IT-related Problems.
6. Reading comprehension	Writing: Letter of Motivation.
7. Writing	Grammar: Verb tenses expressing future; time adverbials; using "enable",
8. Direct and inverse translation of specific parts	"allow", "permit", "make", and "cause".
of the discourse	
1. English grammar	UNIT 6
2. Vocabulary/Use of English	Reading: Difference Engines.
3. Technical-scientific language	Speaking: Expressing hypothetical future.
4. Speaking	Listening: Industrial Processing of Canned Corn.
5. Listening	Grammar: Order of adjectives.
6. Reading comprehension	
7. Writing	
8. Direct and inverse translation of specific parts	
of the discourse	
1. English grammar	UNIT 7
2. Vocabulary/Use of English	Reading: Properties of Materials.
3. Technical-scientific language	Reading: Land and Off-shore Windfarms.
4. Speaking	Speaking: Expressing cause and effect.
5. Listening	Listening: Innovations is Great (1).
6. Reading comprehension	Listening: e-trading and e-selling.
7. Writing	Writing: Paragraph divisions for descriptions.
8. Direct and inverse translation of specific parts	Grammar: Expressing cause and effect.
of the discourse	

1. English grammar 2. Vocabulary/Use of English 3. Technical-scientific language 4. Speaking 5. Listening 6. Reading comprehension 7. Writing 8. Direct and inverse translation of specific parts of the discourse	UNIT 8 Reading: Superconductivity in Orbit. Speaking: Expressing likelihood. Listening: Innovation is Great (2). Listening: Geothermal Energy. Writing: Description of a process. Grammar: Likelihood.
1. English grammar 2. Vocabulary/Use of English 3. Technical-scientific language 4. Speaking 5. Listening 6. Reading comprehension 7. Writing 8. Direct and inverse translation of specific parts of the discourse	UNIT 9 Reading: Water is Everything. Reading: Man-made Building Materials. Speaking: Materials used in industry: purpose and cause. Listening: Fuel Cells. Grammar: Adjectives: present participle, past participle.

Planning

	Class hours	Hours outside the classroom	Total hours
Introductory activities	1	0	1
Lecturing	8	15	23
Autonomous problem solving	8	10	18
ICT suppoted practices (Repeated, Dont Use)	5	8	13
Mentored work	4	16	20
Problem and/or exercise solving	6	10	16
Objective questions exam	6	10	16
Essay	4	15	19
Oral exam	8	16	24

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

Methodologies

	Description
Introductory activities	Activities directed at presenting the subject, taking contact with the students and gathering information in relation to their previous knowledges of the subject.
Lecturing	Explanation of the linguistic contents and its application (Use of English) in the learning process and the acquisition of the contained theoretical contents of the subject.
Autonomous problem solving	Activities focused on dealing with exercises related to the subject. Students develop the skills and the fulfillment of exercises related with the linguistic skills (Use of English) in Technical English and the communicative skills; especially the oral expression (Speaking).
ICT suppoted practices (Repeated, Dont Use)	The practice activities in connection to the four communicative skills: oral understanding (Listening), oral expression (Speaking), reading comprehension (Reading), and written expression (Writing), as well as the linguistic skill (Use of English) in Technical English. These activities are done individually or in group.
Mentored work	The analysis and resolution of practical exercises in relation to grammar and vocabulary combined with the communicative skills. Students autonomously perform tasks within and outside the classroom as homework; especially the communicative task of written expression (Writing).

Personalized assistance

Methodologies	Description
Introductory activities	General guidance to students on the subject concerning goals and how to achieve them. Exploring motivations and interests of the students. Indications on assignments and exercises to be done during the course, dates of assignment deliveries and the examination dates and how to achieve goals on the subject. Indicating that no tutorial will be done on the telephone or internet (electronic post, Skype, etc.). In case of any doubt, students will have to contact directly with the professor in the classroom or during tutorial hours.
Mentored work	Activities carried out in the classroom and during tutorials in order to supervise the learning process of the entrusted tasks and in relation to the communicative skill of written expression (Writing) and the linguistic skill (Use of English) in the English language.
Autonomous problem solving	This activity is directed to boost the realization of the diverse exercises related with the communicative skills and the linguistic skill in the application of the theoretical concepts of the language in practice. Detecting the difficulties in the learning process and lessening the different levels of the English language of each student with the rest of the participants in the course.

Lecturing	The personalized attention in lecturing aims at the correct comprehension and the encouragement given to students in the classroom and during tutorials during the learning process of the theoretical concepts of the subject; as well as making indications on the practice of exercises to be carried out and giving advice about the performance so as to successfully achieve a pass in this subject.

Tests	Description
Oral exam	The aim of the personalized attention of the oral examination centers in the preparation, encouragement and the supervision of the oral expression (Speaking) in the classroom during the course and previous to the oral examination. The purpose of this activity is to encourage students to express not only with relevance and quality in relation to engineering and its specific vocabulary but also with linguistic correctness.

Assessment

	Description	Qualification	Evaluated Competencess	
Problem and/or exercise solving	Evaluation of the theoretical concept of the Technical English language and its application. Performance of practical exercises in relation to the linguistic skill (Use of English).	20	CG10	CT4 CT10 CT18
Objective questions exam	Evaluations of communicative skill of oral understanding (Listening) with contents related to engineering (16%). Evaluations of the communicative skill of reading comprehension (Reading) with contents related to engineering (16%).	32	CG10	CT1 CT10 CT18
Essay	Evaluations of the communicative skill of the written expression (Writing).	16	CG10	CT1 CT4 CT7 CT10 CT18
Oral exam	Evaluations of the communicative skill of oral expression (Speaking) in relation to the linguistic skill and vocabulary in the field of engineering.	32	CG10	CT1 CT4 CT7 CT10 CT17 CT18

Other comments on the Evaluation

1. Particular considerations

There are two assessment systems. Choosing a system excludes the other.

1.1. Continuous assessment

To qualify under the system of continuous evaluation, students are required to attend 80% of the total lecture hours with academic progress and involvement. Therefore students not attending the total hours of the percentage established will lose this option. Students making use of the continuous evaluation counts 100% in the assessment of their final grade with the course assignments and testings. The failure to complete the assignments requested along the course will be counted as a zero (0.0). The assignments requested must be delivered or submitted by the deadlines and dates marked beforehand.

1.2. Final assessment

Students making use of the only evaluation or final examination sit for examination with a final overall assessment, taking place on the oficial date established by the School of Industrial Engineering. To this end, students should consult the School web site, where the examination date and time are specified in accordance to students subject attendance either Campus or City Centre (Torrecedeira).

2. Final subject assessment result

2.1. Continuous assessment

The final mark for this subject is computed taking into consideration all the skills practiced during the course. Therefore each of them counts as follows:

Listening: 16%.

Speaking: 32%.

Reading: 16%.

Writing: 16%.

On the other hand, Use of English examination sums up 20%.

So the final mark will be established adding the communicative skills and Use of English tests to sum up 100%, being 5 (five) the mark necessary to obtain a pass in all skills and Use of English tests.

Students, who in the publication of the first assessment record, have scored a non-pass in one or several skills, must retake the part or parts for the corresponding failed skills in the July exam of the current course to obtain a pass. In case of a second non-pass in July, students must undergo examination for all skills in future courses. Therefore, those passed parts will not be taken into account in the future or subconsequent to course to the current one .

Partial or total plagiarism in any of the assignment or activity will result in an automatic non-pass on the subject. Plead ignorance of what plagiarism is, will not exempt students of their responsibility in this regard.

2.1. Final Assessment

The only assessment is computed as follows: Listening: 16%. Speaking: 32%. Reading: 16%. Writing 16%, whereas Use of English examination sums up 20%.

So the final mark will be established adding skills and Use of English test to sum up 100%, being 5 (five) the mark necessary to obtain a pass in all skills and short answer tests.

Regarding July assessment (second call assessment) continuous evaluation students will undergo examination for the specific parts of the subject contents not completed; while students of the only examination who failed in the previous exam notification (first call) must undergo an assessment of the total subject contents (100%).

Both continuous assessment and final assessment will take into account not only the relevance and appropriateness of the content of the answers, but also their linguistic correctness.

3. Additional considerations

3.1. Forbidden materials or devices

In addition, during the examinations no dictionaries, notes or electronic devices (mobile phones, tablets, PCs, etc.) will be allowed.

3.2. Information and deadlines

It is students responsibility to check FAITIC or their e-mails to be kept up to date on the uploaded teaching materials, as well as to be aware of examination or submission dates.

3.3. Erasmus students

All the comments here indicated also pertain to Erasmus students. In the event of not being able to access information on FAITIC, students have to contact the teacher to solve the problem.

3.4. Ethical commitment. Students are requested to present an adequate ethical behaviour. In case of detecting an unethical behaviour (coping, plagiarism, use of not authorized electronic devices, and others) will be considered that the student does not meet the requisites necessary to pass the subject. In this case, the global qualification in the present academic course will be of a fail (0.0).

Sources of information
Basic Bibliography
Beigbeder Atienza, Federico, **Diccionario Técnico Inglés/Español; Español/Inglés**, Díaz de Santos,
Collazo, Javier, **Diccionario Collazo Inglés-Español de Informática, Computación y otras Materias**, McGraw-Hill,
Hornby, Albert Sidney, **Oxford Advanced Learner s Dictionary**, Oxford University Press,
Jones, Daniel, **Cambridge English Pronouncing Dictionary with CD**, Cambridge University Press,
Hewings, Martin, **English Pronunciation in Use, Advanced with Answers, Audio CDs and CD-ROM**, Cambridge University Press,
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Picket, Nell Ann; Laster, Ann A. & Staples Katherine E., **Technical English: Writing, Reading and Speaking**, Longman,
Complementary Bibliography
www.agendaweb.org,
www.bbc.co.uk/worldservice/learningenglish/,
www.edufind.com/english/grammar,

www.voanews.com/specialenglish,
iate.europa.eu, **Technical English Dictionary**,
www.howjsay.org, **A free online Talking English Pronunciation Dictionary**,

Recommendations

Other comments

We recommend students, who wish to take part in this course, to have a prior A1 level in English so as to reach the A2 level, according to the Common European Framework of Reference for Languages of the Council of Europe.

Requisites:
To register in this subject it is necessary to have passed or to be registered for all the subjects of the lower-division courses to the course where this subject is placed.

We also recommend continuous assessment due to the methodology used to practice and consolidate the learning process of the subject contents. Therefore, the active participation of students is essential to pass the Technical English subject requisites.

It is advisable to check the School's lectures timetable so as to avert imcompatibility of attendance with any other subject. Therefore students will not be permitted to sit for continuous evaluation if there is overlap.

In order to avoid damaging computers, students will not be allowed to take drinks or food into the classroom. If the ingestion of liquid or food is necessary, students must show an official medical prescription.

Contingency plan

Description

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.

When face-to-face teaching is not possible, teaching methodologies will be adapted to the electronic means that are given to the teachers and to the documents provided through FAITIC and other platforms, e-mail, etc.

All assessable activities and tests will be done remotely. Assessment criteria remain the same, although the examination process will be adapted to the electronic means provided to the teachers, if needed and when ruled by the Dean.

Any changes will be notified to the concerned students properly, on time and in a detailed manner.

Counselling will be scheduled virtually (e-mail and virtual office)

IDENTIFYING DATA				
Technical English II				
Subject	Technical English II			
Code	V12G380V01904			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	English			
Department				
Coordinator	García de la Puerta, Marta			
Lecturers	García de la Puerta, Marta			
E-mail	mpuerta@uvigo.es			
Web				
General description	This course aims at providing students with a systematic adequacy to develop the appropriate skills for communicating in Technical English at level B1 according to the Common European Framework of Reference for Languages (CEFR). As far as possible, contents will be adapted to the level of each student.			

Competencies	
Code	
CG10	CG10 Ability to work in a multidisciplinary and multilingual environment.
CT1	CT1 Analysis and synthesis
CT4	CT4 Oral and written proficiency in a foreign language.
CT7	CT7 Ability to organize and plan.
CT9	CT9 Apply knowledge.
CT10	CT10 Self learning and work.
CT17	CT17 Working as a team.
CT18	CT18 Working in an international context.

Learning outcomes	Competences	
To improve students' sense of linguistic awareness of English as a second language, the grammatical and lexical mechanisms and types of expressions.	CG10	CT1 CT4 CT7 CT9 CT10 CT17 CT18
Improving students' listening and reading skills, as well as their speaking and writing skills in Technical English at intermediate level (B1).	CG10	CT1 CT4 CT7 CT9 CT10 CT17 CT18
To upgrade students' grammatical and lexical notions of the English language, and the comprehension of basic Technical English structures at B1 level.	CG10	CT1 CT4 CT7 CT9 CT10 CT17 CT18
To encourage students to use the English language within the engineering context, and the benefits and usefulness of the English language when applying their grammatical, lexical, and cultural knowledge	CG10	CT1 CT4 CT7 CT9 CT10 CT17 CT18

Promoting students' critical autonomy for the comprehension and understanding of dialogues and texts written in Technical English.	CG10	CT1 CT4 CT7 CT9 CT10 CT17 CT18

Contents	
Topic	
UNIT 1. Technical Vocabulary for Engineers	UNIT 1 Increasing knowledge of technical vocabulary and grammar; learning how to use technical vocabulary and grammar accurately and effectively. Expressing facts and numbers (mathematical expressions, dates, amounts, internet symbols and abbreviations); saying calculations, results and approximations. Describing dimensions and specifications; phrases related to length, width, thickness, etc.
UNIT 2. Professional Presentations	UNIT 2 General guidelines for delivering oral presentations: identifying what makes a professional presentation effective. Presenting information in an organized and engaging way. Sharing data in charts and graphs: Presenting data; talking about trends and figures; describing and referring to visual aids; describing cause and consequence; cause-effect verbs. Structuring a presentation: How to create the perfect introduction, main body paragraphs and conclusion; language for linking the parts, for focusing and emphasizing your point; language for recapping and returning to your point. Non-verbal communication. Illustrating the importance of body language and voice power. Ways of emphasizing your message to communicate it clearly and persuasively. Presentation language: Using persuasive language in a presentation. Learning useful terminology and expressions that you can apply to professional presentations.
UNIT 3. Professional English in Use and Technical Writing	UNIT 3 Describing processes; verbs for describing stages of a process; time sequencers; active vs passive. Describing devices, mechanisms, components, inventions, innovations, positions of assembled components, etc. by its shape, properties, technical function, applications and material; explaining how technology works; verbs and adjectives to describe advantages and disadvantages; material properties vocabulary; machine part vocabulary; relative clauses; prepositions of position; verbs and nouns for describing design problems; cause and effect: "if" clauses. Writing and using Email at work: Learning a general organization pattern that works for many types of emails; learning about tone and formality in email writing style; identifying good and bad features: correcting errors; learning useful phrases, terminology and common email expressions for each part of the email.

UNIT 4. Applying for a Job	UNIT 4 Research and Preparation: Identifying the stages in the job application process; researching yourself; identifying your skills and experience; Job advertisement jargon. Writing an impressive CV: Considering different models of CV´s and digital application materials; creating a strong first impression; highlighting your key skills and strengths; highlighting your work experience; phrases for demonstrating your strengths and weaknesses; avoiding common CV mistakes; phrases to give details of your personal characteristics, qualifications, skills, and professional experience; common CV verbs (action verbs); avoiding spelling mistakes, noun-phrases, etc. Writing effective cover letters: Identifying features of cover letters; structuring a cover letter; phrases for opening a cover letter; talking about the job you are applying for; demonstrating skills and experience; matching skills and experience to the job; closing expressions; formal expressions. Successful interviews: Preparing for the interview; making a positive first impression; dealing effectively with interview questions; talking about yourself; demonstrating interest and motivation; giving details of your skills and experience; positive adjectives; avoiding common mistakes; providing you have done research.

Planning			
	Class hours	Hours outside the classroom	Total hours
Introductory activities	1	0	1
Mentored work	4	16	20
Autonomous problem solving	8	10	18
ICT suppoted practices (Repeated, Dont Use)	5	8	13
Lecturing	8	15	23
Problem and/or exercise solving	6	10	16
Essay	4	15	19
Objective questions exam	3	5	8
Oral exam	8	16	24
Objective questions exam	3	5	8
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Introductory activities	Activities aimed at presenting the subject, getting in touch with students and gathering information about their previous knowledge on the topic.
Mentored work	Analysis and resolution of practical exercises related to the grammatical and lexical contents, and to the communication skills. The students must develop these activities in an autonomous way, specially those homework activities concerning Writing skills.
Autonomous problem solving	Activities in which problems are presented and/or exercises related to the subject. The student must develop the analysis and resolution of problems and/or activities concerning the four communicative skills at an individual level, as well as the technical English linguistic skill (Use of English); specially those ones concerning Speaking.
ICT suppoted practices (Repeated, Dont Use)	Practice of the four communicative skills: listening, speaking, reading and writing, as well as the technical English linguistic skill (Use of English) at an individual or group level.
Lecturing	Explanation of linguistic contents and their application (Use of English) for the learning and acquisition of the theoretical contents of the subject.

Personalized assistance	
Methodologies	**Description**
Introductory activities	The objective of the introductory activities is to provide general guidance on the subject; to promote learning strategies; to make general notes about the work and exercises, deadlines for the submission of work and the exam dates; and to give advice on how to pass the subject. It is important to know that no tutorials will be done on the telephone or internet (email, Skype, etc.). In case of any doubt or comment, students should contact directly with the professor in the classroom or during tutorial hours.
Autonomous problem solving	This activity seeks to help students with the practical exercises related to the communicative skills and the linguistic skills and their application for the learning and acquisition of the theoretical contents of the subject.

Mentored work	Practice of the different exercises in relation to the communicative skills and linguistic skills in order to apply English theoretical concepts.
Lecturing	The personalised attention for the master class is focused on the attention of students in the classroom and during tutorial hours. It focuses on the correct comprehension and promotion of the learning of the subject□s theoretical concepts, as well as on providing guidance on work and practical exercises and on giving advice on how to pass the subject.

Tests	**Description**
Oral exam	The objective of the personalised attention of the oral exam is focused on the preparation, promotion and supervision of the oral expression (Speaking) in the classroom during the course and before the exam. This activity seeks to help the students not only to express themselves with relevance and appropriateness using the topics and vocabulary from the field of engineering, but also with linguistic correction.

Assessment

	Description	Qualification	Evaluated Competencess	
Problem and/or exercise solving	Evaluation of theoretical concepts and their application. Resolution of practical exercises related to the linguistic skill (Use of English) of technical English.	20	CG10	CT7 CT10 CT18
Essay	Evaluation of the writing skill.	16	CG10	CT1 CT4 CT7 CT9 CT10 CT18
Objective questions exam	Evaluation of the listening skill with engineering-related contents.	16	CG10	CT4 CT9 CT10 CT18
Oral exam	Evaluation of the speaking skill with engineering-related vocabulary and topics.	32	CG10	CT1 CT4 CT7 CT10 CT17 CT18
Objective questions exam	Evaluation of the reading skill with engineering-related topics and vocabulary.	16	CG10	CT1 CT4 CT7 CT10 CT17 CT18

Other comments on the Evaluation

1. Particular considerations

There are two assessment systems: continuous or final. The selection of a system excludes the other.

1.1. Continuous assessment

In order to qualify for the system of continuous evaluation, students are required to attend 80% of the total lecture hours with academic progress and participation. Students not reaching that percentage will lose this option. The essays and tests done during the course will be worth 100 % of the final assessment for those students choosing the continuous evaluation. The non completion of the assignments requested during the course will be counted as a zero (0.0). The assignments requested must be delivered or submitted by the deadlines and dates marked beforehand.

1.2. Final assessment

Students choosing the final examination will have to take a final overall tests that will take place on the official date established by the School of Industrial Engineering. To this end, students should consult the school's website, where the examination date and time are specified in accordance to students' centre (campus or city) in which they took the subject.

2. Subject's final grade

2.1. Continuous assessment

The final mark for this subject is calculated taking into consideration all the skills practised during the course. Therefore,

each one of them is given the following weight in the final grade:

Listening: 16%.

Speaking: 32%.

Reading: 16%.

Writing: 16%.

On the other hand, the practical exercises related to the grammatical and lexical contents and to the communicative skills, and the application of linguistic contents (Use of English) will have a weight of 20% of the mark obtained.

Therefore, both parts (theory and practice) will add up to 100%, being 5 (five) the required mark to pass the subject.

In order to pass the course through continuous assessment, it is necessary to obtain a minimum mark of 4/10 in all the parts. If not, the subject's average final mark will be a maximum of 4/10, even when the exam's arithmetic average is above that.

In order to completely pass the course, students who obtained a mark below 4 in any of the parts on the first edition of records will have to resit the failed part(s) in an exam in July of the current academic year. If the course is not pass in the second call, students will have to resit the exam of the whole course in future calls, except for the next assessment call in September.

Partial or total plagiarism in any of the assignments or activities will result in an automatic fail of the subject. To claim ignorance of what plagiarism is, will not exempt students of their responsibility in this regard.

2.2. Final Assessment

The final assessment is calculated as follows:

Listening: 16%.

Speaking: 32%.

Reading: 16%.

Writing 16%

On the other hand, the practical exercises related to the grammatical and lexical contents and to the communicative skills, and the application of linguistic contents (Use of English) will have a weight of 20% of the mark obtained. Therefore, both parts (theory and practice) will add up to 100%, being 5 (five) the required mark to pass the subject.

Regarding July's test, continuous assessment students will take the exam for the specific parts failed, while final assessment students who failed must take an exam including all the skills and linguistic contents of the subject.

Both continuous and final assessment will take into account not only the relevance and appropriateness of the content of the answers, but also their linguistic correctness.

3. Additional considerations

3.1. During the examinations no dictionaries, notes or electronic devices (mobile phones, tablets, PCs, etc.) will be allowed.

3.2. It is students' responsibility to check all the resources in MOODLE and/or their e-mails, as well as to be aware of examination or submission dates.

3.3. All the above-mentioned comments also pertain to Erasmus students. In the event of not being able to access MOODLE, students must contact the professor to solve the problem.

3.4. Students are requested to have an adequate ethical behaviour. In case of detecting an unethical behaviour (coping, plagiarism, use of not authorized electronic devices, and others), it will be considered that the student does not meet the requisites necessary to pass the subject. In this case, the overall qualification in the current academic course will be of a fail (0.0).

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Hancock, Mark, **English Pronunciation in Use: Intermediate**, Cambridge University Press,

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Picket, Nell Ann; Laster, Ann A. & Staples Katherine E., **Technical English: Writing, Reading and Speaking**, Pearson Limited Education,

Complementary Bibliography

www.agendaweb.org,

www.bbc.co.uk/worldservice/learningenglish/,

www.edufind.com/english/grammar,

www.voanews.com/specialenglish,

www.mit.edu, **Massachusetts Institute of Technology**,

www.iate.eu, **Eu's Multilingual Technical and Scientific Dictionary**,

Recommendations

Other comments

We recommend students to have some knowledge of English. This course will start from an A2 level and it will reach B1 level, according to the European Framework of Reference for Languages of the Council of Europe.

Requisites:

To register in this subject, it is necessary to have passed or to be registered for all the subjects of the lower courses.

We also recommend continuous assessment due to the methodology used to practise and consolidate the contents of the subject. Therefore, the active participation of students is essential to pass the Technical English subject.

It is advisable to check and compare this subject's timetable with the School's lectures timetables so as to avoid incompatibilities. Students will not be allowed to choose continuous assessment if there is an overlap with other subjects.

In order to avoid damaging the room's computer equipment, students will not be allowed to take drinks or food into the classroom. If the ingestion of liquids or food is due to medical reasons, students must show an official medical prescription.

Sending of emails or the using of mobile phones during the lessons means that the students will be expelled.

The student who does not comply with the information in the previous paragraph will not only be expelled, but s/he will also lose the opportunity to sit for continuous assessment.

In case of discrepancy, the Spanish version of this teaching guide will prevail.

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 (DOCNET).

When teaching at the campus is not possible, teaching methodologies will be adapted to the online means that are available to the teachers and to the documents provided through MOODLE, e-mail, etc.

The different exams and activities counted for the evaluation will be done online.

Assessment criteria will be maintained, while adjusting the way of carrying out the exams to the online means available to the teachers, if necessary and according to the Decision of the Rectorate.

Any changes will be announced in detail properly and on time to the affected students.

Office hours will be scheduled online (e-mail and online campus)

IDENTIFYING DATA				
Methodology for the preparation, presentation and management of technical projects				
Subject	Methodology for the preparation, presentation and management of technical projects			
Code	V12G380V01905			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	Spanish Galician English			
Department				
Coordinator	Cerqueiro Pequeño, Jorge			
Lecturers	Cerqueiro Pequeño, Jorge Comesaña Campos, Alberto			
E-mail	jcerquei@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	The aim of this course is to prepare the students to handle the methods, techniques and tools that are needed for the elaboration and management of technical documents in the industrial field of Engineering. It will also be sought to develop skills in the handling of information and communication technologies related to the professional field of the student's degree. Furthermore, the student skills to communicate properly the knowledge, procedures and results in the Industrial Engineering field will be strenghtened. An essentially practical approach will be used, based in the solution of specific application exercises -with guidance of the subject's lecturer- that will require to apply the theoretical contents of the course.			

Competencies	
Code	
CG3	CG3 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.
CE18	CE18 Knowledge and skills to organize and manage projects. Know the organizational structure and functions of a project office.
CT2	CT2 Problems resolution.
CT3	CT3 Oral and written proficiency.
CT5	CT5 Information Management.
CT7	CT7 Ability to organize and plan.
CT8	CT8 Decision making.
CT9	CT9 Apply knowledge.
CT10	CT10 Self learning and work.
CT13	CT13 Ability to communicate orally and in writing in the Galician language.
CT14	CT14 Creativity.
CT15	CT15 Objectification, identification and organization.
CT17	CT17 Working as a team.
CT18	CT18 Working in an international context.
CT20	CT20 Ability to communicate with people not expert in the field.

Learning outcomes	Competences		
Utilization of methodologies, technics and tools for the organization and management of all technical documents other than engineering projects.	CG3	CE18	CT2 CT7 CT8 CT9 CT10 CT14 CT15 CT17

Skills in the utilization of information systems and in the communications in the industrial scope.	CT5 CT9 CT17
Skills to communicate properly the knowledge, procedures, results, abilities in the field of Engineering in Industry.	CT3 CT13 CT17 CT18 CT20

Contents	
Topic	
1. Types of usual documents in the distinct fields of the professional engineering activities.	1.1. Technical documents: Characteristics and components. 1.2. Types of technical documents according to their contents. 1.3. Types of technical documents according to their recipients and objectives.
2. Methodology for writing and presenting technical documentation: assessments, valuations, expert reports, studies, reports, dossiers and other similar technical works.	2.1. General aspects in elaborating and presenting technical documentation. 2.2. Elaboration of technical reports. 2.3. Elaboration of technical studies. 2.4. Elaboration of assessments, expert reports and valuations. 2.5. Elaboration of dossiers and other technical works. 2.6. Technical work in concurrent and/or collaborative engineering environments.
3. Techniques for research, analysis, evaluation and selection of technological information.	3.1. Typology of technological information. 3.2. Sources of technological information. 3.3. Information and communications systems. 3.4. Techniques for information research. 3.5. Methods for analyzing information. 3.6. Evaluation and selection of information.
4. Laws and regulations about documentation.	4.1. Applicable laws to technical documentation according to its specific field. 4.2. Other applicable regulations.
5. Processing of technical documentation.	5.1. Processing at Government Offices of technical documentation. 5.2. Legitimization and responsabilities in the processing of documentation before Government's Offices. 5.3. Processing of documentation: Concepts, procedures and specifics.
6. Presentation and verbal defence of technical documents.	6.1. Regulations in the elaboration of technical presentations. 6.2. Preparation for the verbal defence of technical documents. 6.3. Techniques and specific tools for the performance of public presentations.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	29.5	44.25	73.75
Laboratory practical	29.5	44.25	73.75
Laboratory practice	1.3	0	1.3
Problem and/or exercise solving	1.2	0	1.2
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Lecturing	Presentation by the lecturer of the contents of the topic to be studied, the theoretical bases and/or guidelines of a specific work, exercise or project to be developed by the student.
Laboratory practical	Activities that require applying theoretical knowledge to specific situations in order to acquire basic and procedural skills related to the topic that is being studied. These activities will be developed in special spaces with specific equipment (laboratories, computer rooms, etc.).

Personalized assistance	
Methodologies	**Description**

Laboratory practical	Activities oriented to the application of knowledge to specific situations, and to acquire basic and procedimental skills related to the field of study. Rooms equiped with specific materials and resources will be used for these classes. An appropriate follow-up will be performed on student's work to verify that the best practices shown in theory classes are applied, and that the procedimental recommendations provided by the lecturer are followed. For all the teaching modalities considered in the Contingency Plan, the tutorial sessions can be carried out using IT tools (email, video-call, FAITIC forums, etc.) according to the modality of prior concertation of the virtual place, date and time.

Assessment

	Description	Qualification	Evaluated Competencess		
Laboratory practical	Interdisciplinary exercises and problems -as close to real cases as possible- will be solved in groups of students, with lecturer orientation and enforcing active participation by the students.	55	CG3	CE18	CT2 CT3 CT5 CT7 CT8 CT9 CT10 CT13 CT14 CT15 CT17 CT18 CT20
Laboratory practice	Making of practical tests and exercises related to the subject's contents, in the scope of the personalised attention to students.	20	CG3	CE18	CT2 CT3 CT5 CT7 CT8 CT9 CT10 CT13 CT14 CT15 CT17 CT18 CT20
Problem and/or exercise solving	Groups of short answer questions related to the subject's contents, to check that the students have understood and assimilated the theoretical and practical contents.	25	CG3	CE18	CT2 CT3 CT7 CT8 CT9 CT14 CT15

Other comments on the Evaluation

Assessment of student's work - individually and/or in groups, either face-to-face or non-presential - will be carried out by the lecturer by weighting appropriatelly the different marks obtained in the activities that were proposed along this course.

Students may opt to follow this course either in the 'Continuous Evaluation' or in the 'Non-Continuous Evaluation' modalities. In both cases the grading of the course will be made according to a numerical system, using values from 0,0 to 10,0 pointsaccording to the current laws that are applicable (R.D. 1125/2003 of 5th September, BOE Nr. 224 of18th September). A minimum overall mark of 5,0 is required to pass this course.

For theFirst Announcement or Edition.

a) 'Continuous Evaluation' modality:

The final mark for the course will be calculated by combining the individual marks awarded in the assessment of the works proposed and elaborated in the practical classes (60% weight) along the term, with the mark awarded for the final test performed in the date stated by the School's Ruling (40% weight).

These marks will asess the behaviour and the implication of the student both in class and in the realisation of the different programmed activities, plus the fulfillment of the deadlines for submitting the works that were proposed, and/or the presentation and defence of those works, etc.

Students not reaching the minimum value of 3,5 points out of 10 that are required for every section,they will either need to perform also the assessment in the SecondAnnouncement date, or to elaborate additional works or practical exercises to achievethe learning goals that were established for the concerned sections.

b) 'Non-ContinuousEvaluation' modality:

There is a two weeks time term after the starting date of the course for the concerned students to justify with documents that it is not possible for them to follow the regular process of continuous evaluation.

In order to pass this course, students renouncing to continuous evaluation will be obligued to perform a final test covering thewhole contents of the course, both theoretical and practical, including short questions, reasoning questions, problem solving and development of practical cases. The mark awarded to the student assessment will be the final mark for the course.

A minimum mark of 5,0 points out of 10,0 possible will be required to pass the course.

For theSecond Announcement or Edition.

Students who did not pass the course in the First Announcement,but that could have passed some specific parts of the theory or practical blocks,will be allowed to be assessed only regarding the failed parts, keeping the marks formerly awarded for the parts already passed, and applying the same assessment criteria to them.

Students wishing to improve their qualification, or students that failed the course on the First Announcement, will need to assist to the Second Announcement, where they will be assessed about the whole contents ofthe course, both theoretical and practical, including short questions, reasoning questions, problem solving and development of practical cases. Students are required to reach a minimum mark of 5,0 points out of 10,0possible to pass the course.

Ethical commitment:

It is expected an adequate ethical behaviour of the student. In case of detecting unethical behaviour (copying, plagiarism, unauthorized use of electronic devices, etc.) shall be deemed that the student does not meet the requirements for passing the subject. In this case, the overall rating in the current academic year will be Fail (0.0).

The use of any electronic device for theassessment tests is not allowed unless explicitly authorized. The fact ofintroducing unauthorized electronic device in the examination room will beconsidered reason for not passing the subject in the current academic year andwill hold overall rating (0.0).

Sources of information

Basic Bibliography

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Complementary Bibliography

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Balzola, Martín, **PREPARACIÓN DE PROYECTOS E INFORMES TÉCNICOS**, 2ª, Balzola, 1996

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García Carbonell, Roberto, **PRESENTACIONES EFECTIVAS EN PÚBLICO: IDEAS, PROYECTOS, INFORMES, PLANES, OBJETIVOS, PONENCIAS, COMUNICACIONES**, 1ª, Edaf, 2006

Himstreet, William C., **GUÍA PRÁCTICA PARA LA REDACCIÓN DE CARTAS E INFORMES EN LA EMPRESA**, 1ª, Deusto, 2000
Sánchez Pérez, José, **FUNDAMENTOS DE TRABAJO EN EQUIPO PARA EQUIPOS DE TRABAJO**, 1ª, McGraw-Hill, 2006
Williams, Robin, **THE NON-DESIGNER'S PRESENTATION BOOK**, 1st, Peachpit Press, 2009

Recommendations

Subjects that it is recommended to have taken before

Graphic expression: Fundamentals of engineering graphics/V12G320V01101
Technical Office/V12G320V01704

Other comments

Previously to the realisation of the final assesments, students should check in the FAITIC platform to know whether it is necessary for them to carry any particular documentation, materials, etc. into the exam room to perform the tests.

It is necessary that the student registered in this course, either has passed all courses of the former years, or is registered in the courses he's not passed yet.

Contingency plan

Description

In the face of the uncertain and unforeseeable evolution of the health alert caused by COVID-19, University of Vigo has established an exception planning that will be activated at the time the government offices and the own University mandate it. Such decision will be made based on safety, health and responsibility criteria, always guaranteeing the continuity of the teaching processes in a partial or full non-classroom scenario. Those already-planned steps will guarantee, at the moment it is required, the development of the teaching processes in a more streamlined and effective way as both the students and the lecturers will know about them beforehand (or with a broad anticipation), by means of the DOCNET standard institutional tool.

According to the instructions provided by the Vice-Rectorate for Learning Organization and Teaching Staff, the following three scenarios are required to be taken into account with their corresponding contingency level:

SCENARIO 1. Full-classroom modality.
All teaching activities will be carried out at the classroom, both for theory and laboratory classes, according to the typical way for the course in the years before 2020.

SCENARIO 2. Half-classroom modality.
In the case the half-classroom teaching modality is activated by the University government, such event will involve a reduction in the capacity of the usual teaching spaces where the full-classroom modality is developed. Because of that, as a first measure the School will provide the teaching staff of the course with the information regarding the new authorized capacities for such teaching spaces so that the teaching activities can be re-organized for the remaining time of the term. It must be pointed out that the necessary re-organization to implement will depend on the specific moment in the term in which this teaching modality is activated. The following guidelines will be followed in the re-organization or the teaching activities:

a) Communication. All students in the course will be informed through the FAITIC teaching portal on the specific conditions for the development of the teaching and the evaluation activities that remain until the end of the term.

b) Adaptation of the tutorial and personalized attention to students. The tutorial sessions may be carried out by means of IT tools (email, video-call, FAITIC forums, etc.), according to the modality of prior concertation of the date and time for the session in the lecturers virtual offices.

c) Classroom and non-classroom activities. From the teaching activities that remain until the end of the term, those that could be carried out by all students in class need to be identified (prioritizing laboratory activities when possible), and those other that will be carried out remotely (theory classes are the ones that usually decrease in effectiveness less in this modality), to the effects of the planning of its efficient performance.

d) Teaching contents and learning goals. There will be no changes neither in the contents to be taught nor in the learning goals, as a consequence of this teaching modality.

e) Teaching schedule. The class timetable and the calendar of the different activities in the course will be maintained as initially planned and scheduled.

f) Bibliography or additional materials to facilitate self-learning. The teaching staff for the course will provide the students with the necessary learning materials to attend to the specific help needs of the students with respect to the course, according to the circumstances that turn out at any particular time, through the FAITIC portal.

With regard to the tools used for the teaching activities in the non-classroom modality, the CAMPUS REMOTO and FAITIC portals will be of preferential use, complemented if necessary with other solutions in order to address specific needs arising along the lecturing period.

SCENARIO 3. Non-classroom modality.
In the case the full non-classroom modality (discontinuation of all on-class learning and evaluation activities) is activated, the tools offered by the platforms currently available at University of Vigo -CAMPUS REMOTO and FAITIC- will be of preferent use. The specific conditions for the reo-organization to be carried out will depend of the particular time in the term in which such modality is mobilized. The following guidelines will be followed in the re-organization of the teaching activities:

a) Communication. All students in the course will be informed through the FAITIC teaching portal on the specific conditions for the development of the teaching and the evaluation activities that remain until the end of the term.

b) Adaptation and/or modification of the teaching methodologies. Even if the teaching methodologies for the course were fundamentally conceived towards the full-classroom modality, the teaching staff considers that they keep in essence their effectiveness in the non-classroom modality. That is why it is proposed to keep them as they are, even if special attention will be payed to their right development and results. Therefore, no changes will be made to the teaching methodologies initially defined for the course.

c) Adaptation of the tutorial and personalized attention to students. The tutorial sessions may be carried out by means of IT tools (email, video-call, FAITIC forums, etc.), according to the modality of prior concertation of the date and time for the session in the lecturers virtual offices.

d) Teaching contents and learning goals. There will be no changes neither in the contents to be taught nor in the learning goals, as a consequence of this teaching modality.

e) Teaching schedule. The class timetable and the calendar of the different activities in the course will be maintained as initially planned and scheduled.

f) Evaluation. No changes will be made neither to the evaluation tests, nor to their corresponding score weights, nor to their set dates.

g) Bibliography or additional materials to facilitate self-learning. The teaching staff for the course will provide the students with the necessary learning materials to attend to the specific help needs of the students with respect to the course, according to the circumstances that turn out at any particular time, through the FAITIC portal.

IDENTIFYING DATA				
Programación avanzada para a enxeñaría				
Subject	Programación avanzada para a enxeñaría			
Code	V12G380V01906			
Study programme	Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	4	2c
Teaching language	Castelán			
Department	Enxeñaría de sistemas e automática			
Coordinator	Camaño Portela, José Luís López Fernández, Joaquín			
Lecturers	Camaño Portela, José Luís López Fernández, Joaquín			
E-mail	joaquin@uvigo.es cama@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	Aplicación práctica de técnicas actuais para a programación de aplicacións industriais para *computadores e dispositivos móbiles. Programación orientada a obxectos en Xava para sistemas *Windows e *Android.			

Competencias	
Code	
CG3	CG3 Coñecemento en materias básicas e tecnolóxicas que os capacite para a aprendizaxe de novos métodos e teorías, e os dote de versatilidade para adaptarse a novas situacións.
CG4	CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial na especialidade de Mecánica.
CE3	CE3 Coñecementos básicos sobre o uso e programación dos ordenadores, sistemas operativos, bases de datos e programas informáticos con aplicación en enxeñaría.
CT2	CT2 Resolución de problemas.
CT5	CT5 Xestión da información.
CT6	CT6 Aplicación da informática no ámbito de estudo.
CT7	CT7 Capacidade para organizar e planificar.
CT17	CT17 Traballo en equipo.

Resultados de aprendizaxe			
Learning outcomes	Competences		
Coñecementos informáticos avanzados aplicables ao exercicio profesional dos futuros enxeñeiros, con especial énfase nas súas aplicacións á resolución de problemas no ámbito da Enxeñaría	CG3 CG4	CE3	CT2 CT5 CT6 CT7 CT17
Coñecer os fundamentos informáticos de diferentes paradigmas de programación (estruturada, modular, orientada a obxectos), as súas posibilidades, características e aplicabilidade á resolución de problemas no ámbito da Enxeñaría	CG3 CG4	CE3	CT2 CT5 CT6 CT7 CT17
Capacidade para utilizar linguaxes e contornas de programación e para programar algoritmos, rutinas e aplicacións de complexidade media para a resolución de problemas e o tratamento de datos no ámbito da Enxeñaría	CG3 CG4	CE3	CT2 CT5 CT6 CT7 CT17
Coñecer os fundamentos do proceso de desenvolvemento de software e as súas diferentes etapas	CG3 CG4	CE3	CT2 CT5 CT6 CT7 CT17
Capacidade para desenvolver interfaces gráficas de usuario	CG3 CG4	CE3	CT2 CT5 CT6 CT7 CT17

Contidos	
Topic	
Programación orientada obxectos en Java	Linguaxe Java. Clases, obxectos e referencias. Tipos de datos, instrucións, operadores. Matrices e coleccións. Herdanza, interfaces, polimorfismo. Tratamento de excepcións. Programación de gráficos mediante JavaFX.
Creación de aplicacións para dispositivos móbiles	Sistemas Android. Ferramentas de desenvolvemento de aplicacións. Interfaces de usuario para dispositivos móbiles. Acceso a bases de datos. Manexo de sensores e cámara. Procesado de imaxe. Comunicación inalámbrica con dispositivos industriais. Acceso a bases de datos.

Planificación			
	Class hours	Hours outside the classroom	Total hours
Prácticas de laboratorio	18	9	27
Resolución de problemas	20	40	60
Lección maxistral	12.5	25	37.5
Informe de prácticas, prácticum e prácticas externas	8.5	17	25.5
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente	
	Description
Prácticas de laboratorio	Desenvolvemento de aplicacións industriais para control, monitorización e automatización de plantas industriais, en sistemas Windows e Android
Resolución de problemas	Posta en práctica dos coñecementos adquiridos na materia mediante a súa aplicación á resolución de problemas habituais na enxeñaría
Lección maxistral	Introdución e descrición dos diferentes conceptos e técnicas relacionados coa materia

Atención personalizada	
Methodologies	**Description**
Lección maxistral	Atención personalizada ás dúbidas do alumnado
Prácticas de laboratorio	Atención personalizada ás dúbidas do alumnado
Resolución de problemas	Atención personalizada ás dúbidas do alumnado
Tests	**Description**
Informe de prácticas, prácticum e prácticas externas	Atención personalizada ás dúbidas do alumnado

Avaliación					
	Description	Qualification	Evaluated Competencess		
Prácticas de laboratorio	Avaliarase as solucións achegadas polo alumno na resolución das diferentes prácticas de laboratorio propostas	40	CG3 CG4	CE3	CT6 CT17
Resolución de problemas	Cualificarase a aplicación dos coñecementos adquiridos na resolución de tarefas de enxeñería específicas	30	CG3 CG4	CE3	CT6 CT17
Lección maxistral	Avaliarase a participación activa do alumno nas diferentes actividades formativas	10	CG3 CG4	CE3	CT6 CT17
Informe de prácticas, prácticum e prácticas externas	Calidade dos informes das diferentes prácticas propostas e das solucións achegadas	20	CG3 CG4	CE3	CT6 CT17

Other comments on the Evaluation

Compromiso ético: Espérase que o alumno presente un comportamento ético adecuado. No caso de detectar un comportamento non ético (copia, plaxio, utilización de aparellos electrónicos non autorizados, e outros) considérase que o alumno non reúne os requisitos necesarios para superar a materia. Neste caso a cualificación global no presente curso académico será de suspenso (0.0).

A avaliación nesta materia ten un compoñente moi alto de avaliación continua durante a realización das diferentes actividades académicas desenvolvidas durante o curso. No caso de convocatorias diferentes da convocatoria de maio, a avaliación realizarase no laboratorio, mediante o desenvolvemento práctico dunha aplicación similar ás desenvolvidas durante o curso.

Bibliografía. Fontes de información

Basic Bibliography

B.C. Zapata, **Android Studio application development**, 2013,

K. Sharan, **Beginning Java 8 fundamentals**, 2014,

I.F. Darwin, **Java cookbook**, 2014,

L.M. Lee, **Android application development coockbook**, 2013,

Complementary Bibliography

N. Smyth, **Android Studio Development Essentials**, http://www.techotopia.com/index.php/Android_Studio_Development_Essentials,

N. Smyth, **Android 4 app development essentials**, http://www.techotopia.com/index.php/Android_4_App_Development_Essentials,

G. Allen, **Beginning Android 4**, 2012,

M. Aydin, **Android 4: new features for application development**, 2012,

J. Bryant, **Java 7 for absolute beginners**, 2012,

M. Burton, D. Felke, **Android application development for dummies**, 2012,

J. Friesen, **Learn Java for Android development**, 2013,

M.T. Goodrich, R. Tamassia, M.H. Goldwasser, **Data structures & algorithms in Java**, 2014,

J. Graba, **An introduction to network programming with Java**, 3rd edition, 2013,

I. Horton, **Beginnning Java 7 Edition**, 2011,

J. Howse, **Android application programming with OpenCV**, 2013,

W. Jackson, **Android Apps for absolute beginners**, 2012,

L. Jordan, P. Greyling, **Practical Android Projects**, 2011,

Y.D. Liang, **Introduction to Java programming**, 2011,

R. Matthews, **Beginning Android tablet programming**, 2011,

P. Mehta, **Learn OpenGL ES**, 2013,

G. Milette, A. Stroud, **Professional Android sensor programming**, 2012,

J. Morris, **Android user interface development**, 2011,

R. Schwartz, etc, **The Android developer's cookbook**, 2013,

R.G. Urma, M. Fusco, A. Mycroft, **Java 8 in action**, 2015,

Recomendacións

Subjects that it is recommended to have taken before

Informática: Informática para a enxeñaría/V12G320V01203

Plan de Continxencias

Description

Os contidos e os resultados de aprendizaxe non deberán ser modificados para poder garantir o recollido nas memorias da titulación. Debe tratarse de axustar os materiais, titorías e as metodoloxías docentes para tratar de acadar estes resultados. Trátase dun aspecto de grande importancia para a superación dos procesos de acreditación a que están sometidas as diferentes titulacións. E dicir, o plan de continxencia debe basearse nun desenvolvemento da materia, adaptando as metodoloxías e os materiais, na procura do cumprimento dos resultados de aprendizaxe de todo o alumnado.

As metodoloxías docentes se impartirán, de ser necesario, adecuándoas ós medios telemáticos que se poñan a disposición do profesorado, ademais da documentación facilitada a través de FAITIC e outras plataformas, correo electrónico, etc.

Cando non sexa posible a docencia presencial, na medida do posible, primarase a impartición dos contidos teóricos por medios telemáticos así como aqueles contidos de prácticas de resolución de problemas, aula de informática, e outros, que poidan ser virtualizados ou desenvolvidos polo alumnado de xeito guiado, intentado manter a presencialidade para as prácticas experimentais de laboratorio, sempre que os grupos cumpran coa normativa establecida no momento polas autoridades pertinentes en materia sanitaria e de seguridade. No caso de non poder ser impartida de forma presencial, aqueles contidos non virtualizables se impartirán ou suplirán por outros (traballo autónomo guiado, etc.) que permitan acadar igualmente as competencias asociados a eles. As titorías poderán desenvolverse indistintamente de forma presencial (sempre que sexa posible garantir as medidas sanitarias) ou telemáticas (e-mail e outros) respectando ou adaptando os horarios de titorías previstos. Asemade, farase unha adecuación metodolóxica ó alumnado de risco, facilitándolle información específica adicional, de acreditarse que non pode ter acceso ós contidos impartidos de forma convencional.

Información adicional sobre a avaliación: manteranse aquelas probas que xa se veñen realizando de forma telemática e, na medida do posible, manteranse as probas presenciais adecuándoas á normativa sanitaria vixente. As probas se desenvolverán de forma presencial salvo Resolución Reitoral que indique que se deben facer de forma non presencial, realizándose dese xeito a través das distintas ferramentas postas a disposición do profesorado. Aquelas probas non

realizables de forma telemática se suplirán por outros (entregas de traballo autónomo guiado, etc.)

IDENTIFYING DATA				
Seguridade e hixiene industrial				
Subject	Seguridade e hixiene industrial			
Code	V12G380V01907			
Study programme	Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	4	2c
Teaching language	Castelán			
Department	Enxeñaría química			
Coordinator	González de Prado, Begoña			
Lecturers	Díez Sarabia, Aida María González de Prado, Begoña			
E-mail	bgp@uvigo.es			
Web				
General description	Nesta materia abórdanse os aspectos máis destacados das técnicas xerais e específicas da Seguridade do Traballo, as diferentes ramas da Hixiene do Traballo, a Ergonomía como disciplina centrada no sistema persoa-máquina, a influencia dos factores psicosociais sobre a saúde do traballador, así como a lexislación elaborada sobre todos estes aspectos.			

Competencias	
Code	
CG4	CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial na especialidade de Mecánica.
CG6	CG6 Capacidade para o manexo de especificacións, regulamentos e normas de obrigado cumprimento.
CG7	CG7 Capacidade para analizar e valorar o impacto social e ambiental das solucións técnicas.
CG11	CG11 Coñecemento, comprensión e capacidade para aplicar a lexislación necesaria no exercicio da profesión de Enxeñeiro Técnico Industrial.
CT2	CT2 Resolución de problemas.
CT5	CT5 Xestión da información.
CT7	CT7 Capacidade para organizar e planificar.
CT8	CT8 Toma de decisións.
CT9	CT9 Aplicar coñecementos.
CT10	CT10 Aprendizaxe e traballo autónomos.
CT14	CT14 Creatividade.
CT16	CT16 Razoamento crítico.
CT17	CT17 Traballo en equipo.
CT20	CT20 Capacidade para comunicarse con persoas non expertas na materia.

Resultados de aprendizaxe		
Learning outcomes		Competences
CG1 Capacidade para a redacción, firma e desenvolvemento de proxectos no ámbito da enxeñaría industrial, que teñan por obxecto, segundo a especialidade, a construción, reforma, reparación, conservación, demolición, fabricación, instalación, montaxe ou explotación de: estruturas, equipos mecánicos, instalacións enerxéticas, instalacións eléctricas e electrónicas, instalacións e plantas industriais, e procesos de fabricación e automatización.	CG6 CG11	CT5
CG2 Capacidade para a dirección das actividades obxecto dos proxectos de enxeñaría descritos na competencia CG1.	CG11	CT5 CT9 CT10
CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial.	CG4 CG7	CT2 CT5 CT9 CT10 CT14 CT16 CT17 CT20

CG11 Coñecemento, comprensión e capacidade para aplicar a lexislación necesaria no exercicio da profesión de Enxeñeiro Técnico Industrial.	CG4 CG6 CG7 CG11	CT2 CT7 CT8 CT9 CT10 CT14 CT17 CT20
CT1 Análise e síntese.	CG4 CG7	CT2 CT5 CT7 CT8 CT9 CT14 CT17 CT20

Contidos	
Topic	
TEMA 1.- Introdución á Seguridade e Hixiene do Traballo	1.1.- Terminoloxía básica 1.2.- Saúde e traballo 1.3.- Factores de risco 1.4.- Incidencia dos factores de risco sobre a saúde 1.5.- Técnicas de actuación fronte aos danos derivados do traballo
TEMA 2.- Evolución histórica e lexislación	2.1.- Evolución histórica 2.2.- Evolución en España 2.3.- A Seguridade e Hixiene do Traballo na lexislación española 2.4.- Responsabilidades e sancións
TEMA 3.- Seguridade do Traballo	3.1.- O accidente de traballo 3.2.- Seguridade do traballo 3.3.- Causas dos accidentes 3.4.- Análise estatística dos accidentes 3.5.- Xustificación da prevención
TEMA 4.- Técnicas de seguridade. Avaliación de riscos	4.1.- Técnicas de seguridade 4.2.- Obxectivos da avaliación de riscos 4.3.- Avaliación xeral 4.4.- Avaliación das condicións de traballo 4.5.- Técnicas analíticas posteriores ao accidente 4.6.- Técnicas analíticas anteriores ao accidente
TEMA 5.- Normalización	5.1.- Vantaxes, requisitos e características das normas 5.2.- Normas de seguridade 5.3.- Procedemento de elaboración 5.4.- Orde e limpeza
TEMA 6.- Sinalización de seguridade	6.1.- Características e normativa 6.2.- Clases de sinalización 6.3.- Sinalización en forma de panel
TEMA 7.- Equipos de protección	7.1.- Individual 7.2.- Integral 7.3.- Colectiva
TEMA 8.- Técnicas específicas de seguridade	8.1.- Máquinas 8.2.- Incendios e explosións 8.3.- Contactos eléctricos 8.4.- Manutención manual e mecánica 8.5.- Industria mecánica 8.6.- Produtos químicos 8.7.- Mantemento
TEMA 9.- Hixiene do Traballo	9.1.- Ambiente industrial 9.2.- Hixiene do traballo e terminoloxía 9.3.- Hixiene teórica e valores límites ambientais 9.4.- Hixiene analítica 9.5.- Hixiene de campo e enquisa hixiénica 9.6.- Hixiene operativa
TEMA 10.- Axentes físicos ambientais	10.1.- Ruído e vibracións 10.2.- Iluminación 10.3.- Radiacións *ionizantes e non *ionizantes 10.4.- Tensión térmica

TEMA 11.- Protección fronte a riscos hixiénicos	11.1.- Vías respiratorias 11.2.- Oídos 11.3.- Ollos
TEMA 12.- Riscos hixiénicos da industria química	12.1.- Procesos inorgánicos 12.2.- Procesos orgánicos 12.3.- Accidentes graves
TEMA 13.- Seguridade nos lugares de traballo	13.1.- A seguridade no proxecto 13.2.- Mapas de riscos
TEMA 14.- Ergonomía	14.1.- Concepto 14.2.- Aplicación da ergonomía á seguridade 14.3.- Carga física e fatiga muscular 14.4.- Carga e fatiga mental
TEMA 15.- Psicosocioloxía aplicada á prevención	15.1.- Factores psicosociais 15.2.- Consecuencias dos factores psicosociais sobre a saúde 15.3.- Avaliación dos factores psicosociais 15.4.- Intervención psicosocial

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	26	49	75
Resolución de problemas	24	22	46
Exame de preguntas obxectivas	4	25	29

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

Metodoloxía docente

	Description
Lección maxistral	Exposición oral e directa, por parte do profesor, dos coñecementos fundamentais correspondentes aos temas da materia.
Resolución de problemas	O profesor expón aos alumnos unha serie de problemas para que os traballen e resolvan en clase en pequenos grupos.

Atención personalizada

Methodologies	Description
Resolución de problemas	Darase a coñecer os alumnos, a principio de curso, os horarios de tutorías nos que se resolverán as duvidas que existan con respecto á teoría, problemas e traballos

Avaliación

	Description	Qualification	Evaluated Competencess	
Resolución de problemas	Proporase ao alumno unha seria de problemas que terá que resolver	40	CG4 CG6 CG7	CT2 CT5 CT8 CT9 CT10 CT14 CT17
Exame de preguntas obxectivas	A finalidade desta proba de resposta múltiple, que figura no calendario de exames da Escola, é avaliar o nivel de coñecementos alcanzado polos alumnos	60	CG11	CT5 CT7 CT8 CT9 CT10

Other comments on the Evaluation

Con respecto ao exame de XULLO (2ª convocatoria), se manterá a cualificación obtida polo alumno nos controis e presentacións / exposicións realizados durante o período docente. Iso significa que o alumno unicamente realizará próbaa tipo test&*nbsp; do devandito exame.&*nbsp; Cando a Escola libere a un alumno do proceso de avaliación continua, a súa cualificación será o 100% da nota obtida en próbaa tipo test anteriormente citada.Compromiso éticoEspérase que o alumno presente un comportamento ético adecuado. En caso de detectar un comportamento non ético (copia, plaxio, utilización de aparellos electrónicos non autorizados, por exemplo), considerarase que *elalumno non reúne os requisitos necesarios para superar a materia.

Bibliografía. Fontes de información

Basic Bibliography

Mateo Floría, P. y otros, **Manual para el Técnico en Prevención de Riesgos Laborales**, 9ª,
Cortés Díaz, J. Mª, **Técnicas de Prevención de Riesgos Laborales: Seguridad e Higiene del Trabajo**, 9ª,

Complementary Bibliography

Menéndez Díez, F. y otros, **Formación Superior en Prevención de Riesgos Laborales**, 4ª,
Gómez Etxebarría, G., **Prontuario de Prevención de Riesgos Laborales**,

Recomendacións

Other comments

Para matricularse nesta materia é necesario superar ou ben matricularse de todas as materias dos cursos inferiores ao curso en que está situada esta materia.

En caso de discrepancias, prevalecerá a versión en castelán desta guía.

Plan de Continxencias

Description

=== MEDIDAS EXCEPCIONAIS PLANIFICADAS ===
Ante a incerta e imprevisible evolución da alerta sanitaria provocada pola COVID- 19, a Universidade establece una planificación extraordinaria que se activará no momento en que as administracións e a propia institución o determinen atendendo a criterios de seguridade, saúde e responsabilidade, e garantindo a docencia nun escenario non presencial ou non totalmente presencial. Estas medidas xa planificadas garanten, no momento que sexa preceptivo, o desenvolvemento da docencia dun xeito mais áxil e eficaz ao ser coñecido de antemán (ou cunha ampla antelación) polo alumnado e o profesorado a través da ferramenta normalizada e institucionalizada das guías docentes DOCNET.

=== ADAPTACIÓN DAS METODOLOXÍAS ===
* Metodoloxías docentes que se manteñen- Todas

* Metodoloxías docentes que se modifican- Ninguna.
As metodoloxías docentes se impartirán, de ser necesario, adecuándoas ós medios telemáticos que se poñan a disposición do profesorado, ademais da documentación facilitada a través de FAITIC e outras plataformas, correo electrónico, etc.

* Mecanismo non presencial de atención ao alumnado (titorías)- As titorias desenvolveranse de forma telemática. Asemade, farase unha adecuación
metodolóxica ó alumnado de risco, facilitándolle información específica adicional, de acreditarse que non pode ter acceso ós contidos impartidos de forma convencional

* Modificacións (se proceder) dos contidos a impartir- nInguno

* Bibliografía adicional para facilitar a auto-aprendizaxe- ninguna

* Outras modificacións

=== ADAPTACIÓN DA AVALIACIÓN ===

* Probas xa realizadas- se mantienen con el mismo peso

Proba XX: [Peso anterior 00%] [Peso Proposto 00%]
...

* Probas pendentes que se manteñen:
Proba XX: [Peso anterior 00%] [Peso Proposto 00%]

Mantéñense os criterios de avaliación adecuando a realización das probas, no caso de ser necesario e por indicación en Resolución Reitoral, ós medios telemáticos postos a disposición do profesorado

* Probas que se modifican- ninguna
[Proba anterior] => [Proba nova]

* Novas probas- ninguna

* Información adicional: As probas se desenvolverán de forma presencial salvo Resolución Reitoral que indique que se deben facer de forma non presencial, realizándose dese xeito a través das distintas ferramentas postas a disposición do profesorado.

IDENTIFYING DATA				
Laser technology				
Subject	Laser technology			
Code	V12G380V01908			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	Spanish English			
Department				
Coordinator	Pou Saracho, Juan María			
Lecturers	Pou Saracho, Juan María			
E-mail	jpou@uvigo.es			
Web				
General description	(*)Introduction to laser technology and its applications for undergraduate students of the industrial field.			

Competencies	
Code	
CG10	CG10 Ability to work in a multidisciplinary and multilingual environment.
CT10	CT10 Self learning and work.

Learning outcomes		
Learning outcomes	Competences	
- Know the physical principles in which it bases the operation of a laser and his parts. - Know the main properties of a laser and relate them with the potential applications. - Know the different types of lasers differentiating his specific characteristics. - Know the main applications of the technology laser in the industry.	CG10	CT10

Contents	
Topic	
Chapter 1.- INTRODUCTION	1. Electromagnetic waves in the vacuum and in the matter. 2. Laser radiation. 3. Properties of the laser radiation.
Chapter 2.- BASICS	1. Photons and energy level diagrams. 2. Spontaneous emission of electromagnetic radiation. 3. Population inversion. 4. Stimulated emission. 5. Amplification.
Chapter 3. COMPONENTS OF A LASER	1. Active medium 2. Excitation mechanisms. 3. Feedback mechanisms. 4. Optical cavity. 5. Exit device.
Chapter 4. TYPES OF LASER	1. Gas lasers 2. Solid-state lasers 3. Diode lasers. 4. Other lasers.
Chapter 5. OPTICAL COMPONENTS AND SYSTEMS	1. Spherical lenses. 2. optical centre of a lens. 3. Thin lenses. Ray tracing. 4. Thin lenses coupling. 5. Mirrors. 6. Filters. 7. OPtical fibers.
Chapter 6. INDUSTRIAL APPLICATIONS	1. Introduction to laser materials processing 2. Introduction to laser cutting and drilling. 3. Introduction to laser welding. 4. Introduction to laser marking. 5. Introduction to laser surface treatments.

Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practical	18	30.6	48.6
Lecturing	32.5	65	97.5
Essay questions exam	1.7	0	1.7
Report of practices, practicum and external practices	1.9	0	1.9
Problem and/or exercise solving	0.3	0	0.3

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

Methodologies

	Description
Laboratory practical	Activities of application of the knowledge to specific situations and of acquisition of basic and practical skills related to the matter object of study. They will be developped in the laboratories of industrial applications of the lasers of the EEI.
Lecturing	Exhibition on the part of the teacher of the contents on the matter object of study. Exhibition of real cases of application of the laser technology in the industry.

Personalized assistance

Methodologies	Description
Laboratory practical	

Assessment

	Description	Qualification	Evaluated Competencess	
Essay questions exam	The examination will consist of five questions of equal value. Four of them will correspond to the contents of theory and the fifth one to the contents seen in the laboratory practices.	70	CG10	CT10
Report of practices, practicum and external practices	The evaluation of the laboratory practices will be carried out by means of the qualification of the corresponding practice reports.	20	CG10	CT10
Problem and/or exercise solving	During the course there will be carried out a test of follow-up of the subject that will consist of two questions of equal value.	10	CG10	CT10

Other comments on the Evaluation

If some student was resigning officially the continuous assessment that is carried out by means of the test of follow-up of the subject, the final note would be calculated by the following formula: (0.8 x Exam qualification) + (0.2 x Practices qualification). It is mandatory to carry out the laboratory parctices in order to pass the subject. It is mandatory to attend 75% of the theory lessons to pass the subject.

Ethical commitment: it is expected an adequate ethical behaviour of the student. In case of detecting unethical behaviour (copying, plagiarism, unauthorized use of electronic devices, etc.) shall be deemed that the student does not meet the requirements for passing the subject. In this case, the overall rating in the current academic year will be Fail (0.0).

The use of any electronic device for the assessment tests is not allowed unless explicitly authorized. The fact of introducing unauthorized electronic device in the examination room will be considered reason for not passing the subject in the current academic year and will hold overall rating (0.0).

Sources of information

Basic Bibliography

Jeff Hecht, **UNDERSTANDING LASERS: AN ENTRY-LEVEL GUIDE**, IEEE, 2008

W.Steen, J. Mazumder, **LASER MATERIALS PROCESSING**, Springer, 2010

Complementary Bibliography

Recommendations

Other comments

Requirements: To register for this module the student must have passed or be registered for all the modules of the previous year.

In case of discrepancies, the spanish version (castellano) will prevail.

Contingency plan

Description

The contents and the results of learning will not owe to be modified for power guarantee the collected in the memories of the qualifications. It owes to treated to adjust the materials, tutorships and the teaching methodologies to treat to achieve these results. It treats of an aspect of big importance stop the overrun of the processes of the one who are subjected the different qualifications. And say, the plan of contingency owes to based in a development of the subject, adapting the methodologies and the materials, in the research of the fulfilment of the resulted of learning of all the students.

The teaching methodologies will impart , to be necessary, to the telematic means that put the disposal of the teaching staff, in addition to the documentation facilitated through FAITIC and other platforms, email, etc.

When it was not possible to presential sesions, in the measure of the possible, will prevail the contained theorists by telematic means as well as those contents of practices of resolution of problems, classroom of computing, and others, that can be virtuals or developed pole students of way guided, tried keep the presential stop the experimental practices of laboratory, always that the groups fulfil with the rule established in the moment by the authorities in sanitary subject and of security. In the case of no power be imparted of form presential, those contents no virtuals will impart or by others (autonomous work guided, etc.) Enabling achieve equally the competitions associated it they. The titorships will be able to developed indistinctly of form presential (always that it was possible to guarantee the sanitary measures) or telematic (and email and others) respecting or adapting the schedules of titorships due. it will do a adecuation methodological to the students of risk, facilitating him additional specific information, to accredit that can not have access to the contained imparted of conventional form.

Additional information envelope to evaluation: they will keep those proofs that already come realizing of telematic form and, in the measure of the possible, will keep the proofs presentials to the normative valid medic. The proofs will develop of form presential except Resolution Reitoral that indicate that they owe do of form non-presential, realizing gave way through the distinct tools put the disposal of the teaching staff. Those proofs no-don of telematic form by others (deliveries of autonomous work guided, etc.)

IDENTIFYING DATA				
Deseño de máquinas II				
Subject	Deseño de máquinas II			
Code	V12G380V01911			
Study programme	Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	4	1c
Teaching language	Castelán Galego			
Department	Enxeñaría mecánica, máquinas e motores térmicos e fluídos			
Coordinator	López Campos, José Ángel			
Lecturers	López Campos, José Ángel			
E-mail	joseangellopezcampos@gmail.com			
Web				
General description	ESTA MATERIA COMPLETA Os COÑECEMENTOS ADQUIRIDOS NA MATERIA DE DESEÑO DE *MAQUINAS-*I ,EN ASPECTOS XERAIS DA *INGENIERIA *MECANICA. *PRORCIONA Ao ALUMNO Os COÑECEMENTOS DOS FUNDAMENTOS *BASICOS E *PRACTICOS DA *INGENIERIA DA *VIBRACION, PARA SER UTILIZADOS TANTO NO DESEÑO *DINAMICO COMO NO MANTEMENTO DAS *MAQUINAS. COMPLÉTANSE DEVANDITOS COÑECEMENTOS CUN TEMA DE *SINTESIS *DIMENSIONAL *OPTIMA E ELEMENTOS DE *MAQUINAS.			

Competencias	
Code	
CG1	CG1 Capacidade para a redacción, sinatura e desenvolvemento de proxectos no ámbito da enxeñaría industrial, na especialidade de Mecánica, que teñan por obxecto, a construción, reforma, reparación, conservación, demolición, fabricación, instalación, montaxe ou explotación de: estruturas, equipos mecánicos, instalacións enerxéticas, instalacións eléctricas e electrónicas, instalacións e plantas industriais, e procesos de fabricación e automatización.
CG4	CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial na especialidade de Mecánica.
CG5	CG5 Coñecementos para a realización de medicións, cálculos, valoracións, taxacións, peritaxes, estudos, informes, planes de labores e outros traballos análogos.
CG6	CG6 Capacidade para o manexo de especificacións, regulamentos e normas de obrigado cumprimento.
CG9	CG9 Capacidade de organización e planificación no ámbito da empresa, e outras institucións e organizacións.
CG10	CG10 Capacidade para traballar nun medio multilingüe e multidisciplinar.
CG11	CG11 Coñecemento, comprensión e capacidade para aplicar a lexislación necesaria no exercicio da profesión de Enxeñeiro Técnico Industrial.
CE13	CE13 Coñecemento dos principios de teoría de máquinas e mecanismos.
CE20	CE20 Coñecementos e capacidades para o cálculo, deseño e ensaio de máquinas.
CT2	CT2 Resolución de problemas.
CT9	CT9 Aplicar coñecementos.
CT10	CT10 Aprendizaxe e traballo autónomos.
CT17	CT17 Traballo en equipo.

Resultados de aprendizaxe			
Learning outcomes	Competences		
Coñecer os compoñentes das máquinas, o seu uso e mantemento.	CG1	CE13	CT2
Saber calcular os elementos máis comunmente usados en máquinas.	CG4	CE20	CT9
Coñecer os aspectos xerais da construción e ensaio de máquinas.	CG5		CT10
Coñecer e saber aplicar as técnicas de mantemento básico en máquinas.	CG6		CT17
Saber utilizar e interpretar os resultados do software usado no deseño de máquinas.	CG9		
	CG10		
	CG11		

Contidos	
Topic	
*ANALISIS, TECNOLOXIA E MEDIDA DAS VIBRACIÓNS *MECANICAS	-FUNDAMENTOS. -VIBRACIÓNS *LONGITUDINALES E *TORSIONALES:1,2 *G.*L. -VIBRACIÓNS DE *N *G.*L. E SISTEMAS CONTINUOS. -*ANALISIS MODAL. -RESPOSTA A EXCITACIÓNS *DINAMICAS XERAIS. -*ANALISIS DE *FOURIER E RESPOSTA NA FRECUENCIA. -MEDIDA DA *VIBRACION.

*SINTESIS DE MECANISMOS	*SINTESIS ESTRUTURAL NON LINEAL. *SINTESIS *DIMENSIONAL *OPTIMA. GUIADO DE *BIELA.
*VIBRACION ALEATORIA	-*ESCITACIONES NON *DETERMINISTICAS. -PROPIEDADES *ESTADISTICAS. -*CORRELACION. -DENSIDADE DE POTENCIA *EXPECTRAL. -RESPOSTA DUN SISTEMA. -DEFORMACIÓN EFICAZ.
DESEÑO *MECANICO BASEADO NA *VIBRACION	-EXCITACIÓNS *DETERMINISTICAS -EXCITACIÓNS NON *DETERMINISTICAS -DESEÑOS DE *ARBOLES.VELOCIDADES CRITICAS.

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	32	60	92
Prácticas de laboratorio	18	33	51
Exame de preguntas de desenvolvemento	2	0	2
Informe de prácticas, prácticum e prácticas externas	0	5	5

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

Metodoloxía docente

	Description
Lección maxistral	CLASE MAXISTRAL NA QUE SE EXPOÑEN Os CONTIDOS *TEORICOS-*PRACTICOS POR MEDIOS TRADICIONAIS (LOUSA) E RECURSOS MULTIMEDIA.
Prácticas de laboratorio	*REALIZACION DE TAREFAS PRACTICAS EN LABORATORIO DOCENTE

Atención personalizada

Methodologies	**Description**
Lección maxistral	
Prácticas de laboratorio	
Tests	**Description**
Exame de preguntas de desenvolvemento	
Informe de prácticas, prácticum e prácticas externas	

Avaliación

	Description	Qualification	Evaluated Competencess		
Exame de preguntas de desenvolvemento	*EVALUACION DOS COÑECEMENTOS *ADQUIRDOS MEDIANTE UN EXAME *TEORICO-PRACTICO de una hora de duracion en la fecha establecida por junta de escuela.	60	CG1 CG4 CG5 CG6 CG9 CG10 CG11	CE13 CE20	CT2 CT9 CT10 CT17
Informe de prácticas, prácticum e prácticas externas	AVALIÁSESE A *REALIZACION DAS MEMORIAS DE PRACTÍCALAS REALIZADAS NO CURSO.	40	CG1 CG4 CG5 CG6 CG9 CG10 CG11	CE13 CE20	CT2 CT9 CT10 CT17

Other comments on the Evaluation

A MATERIA APROBÁSESE SE SE OBTÉN UNHA CALIFICACION IGUAL Ou MAIOR QUE UN CINCO COMO NOTA FINAL, DA SEGUINTE FORMA:

1.- A ASISTENCIA Ao LABORATORIO, As MEMORIAS DE CADA PRACTICA E TRABALLOS TUTELADOS TERÁN UNHA VALORACION MAXIMA DE 2 PUNTOS DA NOTA FINAL, ESTA CALIFICACION CONSERVÁSESE NA SEGUNDA CONVOCATORIA.
2.- O EXAME FINAL TERÁ UNHA VALORACION MAXIMA DE 8 PUNTOS NA NOTA FINAL.

Compromiso ético: espérase que o alumno presente un comportamento ético adecuado. No caso de detectar un comportamento non ético (copia, plaxio, utilización de aparellos electrónicos non autorizados, e outros) considerarase que o alumno non reúne os requisitos necesarios para superar a materia. Neste caso a cualificación global no presente curso académico será de suspenso (0.0).

Bibliografía. Fontes de información

Basic Bibliography

SINGERESU S. RAO, **MECHANICAL VIBRATIONS**, 1995,

Complementary Bibliography

SINGERESU S. RAO, **APPLIED NUMERICAL METHODS FOR ENGINEERS AND SCIENTISTS**, 2001,
S.TIMOSHENKO, **RESISTENCIA DE MATERIALES I y II**, 1970,
A.A. SAHABANA, **VIBRATION OF DISCRETE AND CONTINUOS SYSTEMS**, 1997,
ROBER L. NORTON, **DISEÑO DE MAQUINARIA**, 1998,
JOSEPH EDWUARD SHIGLEY, **DISEÑO EN INGENIERIA MECANICA**, 1998,

Recomendacións

Subjects that it is recommended to have taken before

Resistencia de materiais/V12G380V01402
Teoría de máquinas e mecanismos/V12G380V01306
Deseño de máquinas I/V12G380V01304
Enxeñaría gráfica/V12G380V01602

Other comments

Requisitos: Para matricularse nesta materia é necesario superar ou ben estar matriculado de todas as materias dos cursos inferiores ao curso no que está situada esta materia.

En caso de discrepancias, prevalecerá a versión en castelán desta guía.

Plan de Continxencias

Description

=== MEDIDAS EXCEPCIONAIS PLANIFICADAS ===
Ante a incerta e imprevisible evolución da alerta sanitaria provocada polo *COVID-19, a Universidade de Vigo establece unha planificación extraordinaria que se activará no momento en que as administracións e a propia institución determíneno atendendo a criterios de seguridade, saúde e responsabilidade, e garantindo a docencia nun escenario non presencial ou parcialmente presencial. Estas medidas xa planificadas garanten, no momento que sexa preceptivo, o desenvolvemento da docencia dun modo máis áxil e eficaz ao ser coñecido de antemán (ou cunha ampla antelación) polo alumnado e o profesorado a través da ferramenta normalizada e institucionalizada das guías docentes.

=== ADAPTACIÓN DAS METODOLOXÍAS ===
* Metodoloxías docentes que se manteñen

* Metodoloxías docentes que se modifican
Mantéñense todas as metodoloxías docentes pero neste caso adaptadas á docencia non presencial. En canto ás sesións maxistrais, substituiranse por vídeos detallados explicando os conceptos teórico-prácticos fundamentais, facilitarase ao alumnado o contido teórico mediante documentación. As sesións de prácticas, constan fundamentalmente de contido baseado na resolución de problemas mediante programación. É por iso que son facilmente *adaptables, celebraranse as sesións de prácticas *online e de igual maneira o alumno debe realizar os informes de prácticas pertinentes.
* Mecanismo non presencial de atención ao alumnado (*tutorías)
Fixarase un horario de *tutorías para atender as dúbidas do alumnado. A maiores, dedicaranse parte das sesións maxistrais a aclarar as dúbidas que puidesen xurdir relativas ao desenvolvemento dos contidos tanto teóricos como prácticos da materia.
* Modificacións (si proceden) dos contidos a impartir
Non se *preveen modificacións dos contidos, con todo, de resultar imposible completar o temario, avaliarase ao alumno de todos aqueles contidos que si que puidesen desenvolverse adecuadamente.
* Bibliografía adicional para facilitar o auto-aprendizaxe

* Outras modificacións

=== ADAPTACIÓN DA AVALIACIÓN ===

* Probas xa realizadas
Exame de preguntas de desenvolvemento: [Peso anterior 60%] [Peso Proposto 40%]
Informe de prácticas, *prácticum e prácticas externas: [Peso anterior 40%] [Peso Proposto 60%]

* Probas pendentes que se manteñen
Exame de preguntas de desenvolvemento: [Peso anterior 60%] [Peso Proposto 40%]
Informe de prácticas, *prácticum e prácticas externas: [Peso anterior 60%] [Peso Proposto 40%]

* Probas que se modifican

* Novas probas

* Información adicional

IDENTIFYING DATA				
Materiais e tecnoloxías en fabricación mecánica				
Subject	Materiais e tecnoloxías en fabricación mecánica			
Code	V12G380V01912			
Study programme	Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	9	Optional	4	1c
Teaching language	Castelán Galego			
Department	Deseño na enxeñaría Enxeñaría dos materiais, mecánica aplicada e construción			
Coordinator	Collazo Fernández, Antonio Peláez Lourido, Gustavo Carlos			
Lecturers	Collazo Fernández, Antonio Peláez Lourido, Gustavo Carlos			
E-mail	acollazo@uvigo.es gupelaez@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	Materia de intensificación en materiais e fabricación na especialidade de construcción de maquinaria na que se realiza un especial enfoque á utilización de materiais para os procesos e recursos de produción tanto de máquinas, equipos e ferramentas.			

Competencias	
Code	
CG4	CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial na especialidade de Mecánica.
CG5	CG5 Coñecementos para a realización de medicións, cálculos, valoracións, taxacións, peritaxes, estudos, informes, planes de labores e outros traballos análogos.
CG6	CG6 Capacidade para o manexo de especificacións, regulamentos e normas de obrigado cumprimento.
CG7	CG7 Capacidade para analizar e valorar o impacto social e ambiental das solucións técnicas.
CG8	CG8 Capacidade para aplicar os principios e métodos da calidade.
CE25	CE25 Coñecementos e capacidades para a aplicación da enxeñaría de materiais.
CE26	CE26 Coñecemento aplicado de sistemas e procesos de fabricación, metroloxía e control da calidade.
CT5	CT5 Xestión da información.
CT7	CT7 Capacidade para organizar e planificar.
CT8	CT8 Toma de decisións.
CT9	CT9 Aplicar coñecementos.
CT10	CT10 Aprendizaxe e traballo autónomos.
CT14	CT14 Creatividade.
CT17	CT17 Traballo en equipo.
CT20	CT20 Capacidade para comunicarse con persoas non expertas na materia.

Resultados de aprendizaxe			
Learning outcomes	Competences		
Coñecer a base tecnolóxica sobre a que se apoian as investigacións máis recentes no uso de máquina-ferramenta e equipos para fabricación por conformado e máquinas de medición por coordenadas	CG5 CG8		CT5 CT7 CT10
Coñecer os principais materiais empregados en compoñentes de máquinas.	CG6	CE25	CT5 CT10
Coñecer os requirimentos dos distintos compoñentes para a realización dunha selección adecuada de materiais.	CG5	CE25	CT17
Coñecer o proceso experimental utilizado cando se traballa con maquinas de alta velocidade (HSM) para fabricación por mecanizado	CG4 CG5 CG6 CG8	CE26	CT5 CT7 CT8 CT9 CT10
Coñecer a actuais tecnoloxías para mellora das propiedades superficiais: resistencia ao desgaste e á corrosión. Adquirir criterios para a selección do tratamento de superficies máis adecuado para alongar a vida en servizo dun compoñente.	CG8	CE25	CT7 CT10
Aplicar os criterios da Mecánica da Fractura no deseño de maquinaria.		CE25	

Identificar e interpretar as posibles causas de fallos dun material en función das condicións de servizo. Propor solucións para evitar o fallo de compoñentes. Adquirir habilidades para a realización e interpretación de ensaios non destrutivos.	CG4 CG6	CE25	CT8 CT20
Analiza e propón solucións operativas a problemas no ámbito da enxeñaría de materiais	CG4 CG5 CG7	CE25	CT5 CT7 CT8 CT9 CT14
Amosar capacidades de comunicación e traballo en equipo. Identifica as propias necesidades de información e utiliza os medios, espazos e servizos dispoñibles para deseñar e executar procuras adecuadas ao ámbito temático.	CG6		CT5 CT10 CT17 CT20
Levar a termo os traballos encomendados a partir das orientacións básicas dadas polo profesor, decidindo a duración das partes, incluíndo achegas persoais e ampliando fontes de información.	CG4 CG6		CT5 CT7 CT8 CT10
Profundar nas técnicas de verificación de máquina-ferramenta.	CG5	CE26	CT5 CT9 CT20
Caracterizar e Modelar máquinas para o conformado	CG4 CG5 CG6 CG8	CE26	CT5 CT8 CT9 CT10 CT14 CT17 CT20
Saber analizar con métodos avanzados a influencia do procesamento de material na selección e uso de equipos para o conformado	CG5	CE26	CT5 CT10
Saber facer unha Análise CAE de procesos de conformado	CG5	CE26	CT5 CT9

Contidos

Topic	
1. Materiais en fabricación mecánica	1. Materiais utilizados en elementos de máquinas: tipos e propiedades. 1.1 Aceiros de fácil mecanización / maquinabilidad mellorada. 1.2 Materiais para árbores e eixes. 1.3 Materiais para engrenaxes, rodamentos e resortes. 1.4. Materiais para ferramentas e matrices. 2. Comportamento en servizo 2.1 Aplicación ao deseño da mecánica de fractura. 2.2 Comportamento a fatiga. 2.3 Análise de fallos en servizo. 3. Selección de materiais 3.1 Metodoloxía estructurada de selección de materiais. 3.2 Bases de datos. Resolución de casos prácticos. 4. Tratamentos de mellora das propiedades superficiais 4.1 Desgaste. Ensaios de avaliación e estratexias de mellora da resistencia ao desgastar. 4.2 Corrosión. Tecnoloxía de protección anticorrosiva. Análise de casos prácticos. 5. Materiais compostos
2. Tecnoloxías en fabricación mecánica	2.1. Estudo da influencia do Procesamento de material no comportamento en servizo de maquinaria e equipos para fabricación mecánica por 2.1.1. redución de masa 2.1.2. conservación de masa 2.1.3. outros procesos de fabricación 2.2. Estudo do Recurso Maquinaria: Máquinas-Ferramenta, Prensas e outros equipos para a fabricación mecánica e o control dimensional 2.2.1. Deseño, fundamentos e características construtivas. 2.2.2. Verificación, reglaxe e posta a punto: Avaliación de rixidez, Medida da aceleración. 2.2.3. Utillaxe e equipamento 2.2.4. Utilización e control en tempo real. Modelado e caracterización.

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	22	29.6	51.6
Seminario	13	16	29
Prácticas de laboratorio	24	24	48
Presentación	8	38	46
Seminario	3	5.4	8.4
Actividades introdutorias	2	1	3
Exame de preguntas obxectivas	0.5	11	11.5
Resolución de problemas e/ou exercicios	1.25	15	16.25
Resolución de problemas e/ou exercicios	1.25	10	11.25

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

Metodoloxía docente

	Description
Lección maxistral	Exposición básica de contidos. Resolución de exercicios, problemas e casos. Avaliación do proceso de aprendizaxe mediante probas obxectivas
Seminario	Resolución de casos prácticos.
Prácticas de laboratorio	Realización de ensaios e aplicación de técnicas específicas en laboratorio. Resolución de casos. Uso de software combinado ás experiencias no taller de fabricación
Presentación	Presentación oral de traballos tutelados individuais e en grupo
Seminario	Titorización de traballos e seguimento do proceso de aprendizaxe.
Actividades introdutorias	Presentación da materia. Introdución

Atención personalizada

Methodologies	Description
Prácticas de laboratorio	Nesta actividade académica o profesor atenderá as consultas do alumno de forma individual ou en grupos pequenos. Poderá desenvolverse de forma presencial (directamente na aula e nos momentos que o profesor ten asignados a titorías de despacho) ou de forma non presencial nos casos indicados polo profesor (a través do correo electrónico).
Seminario	Tempo reservado polo profesor para atender e resolver as dúbidas do alumno. Esta actividade docente ten como función orientar o proceso de aprendizaxe do alumno. O alumno poderá inscribirse ás titorías, na medida do posible a través da plataforma *faitic. levará a cabo no horario proposto pola coordinación da materia. Crearase un exercicio na plataforma faitic para que o estudante poida realizar consultar *generals da materia.

Avaliación

Description	Qualification	Evaluated Competencess

Lección maxistral	As actividades formativas de adquisición de coñecementos e de estudo individual serán avaliadas mediante probas escritas ou orais. Resultados da aprendizaxe: Coñecer a base tecnolóxica sobre a que se apoian as investigacións máis recentes no uso de máquina-ferramenta e equipos para fabricación por conformado e máquinas de medición por coordenadas. Coñecer os principais materiais empregados en compoñentes de máquinas. Coñecer os requirimentos dos distintos compoñentes para a realización dunha selección adecuada de materiais. Coñecer o proceso experimental utilizado cando se traballa con maquinas de alta velocidade (HSM) para fabricación por mecanizado. Coñecer as actuais tecnoloxías para mellora das propiedades superficiais: resistencia ao desgaste e á corrosión. Adquirir criterios para a selección do tratamento de superficies máis adecuado para alongar a vida en servizo dun compoñente. Aplicar os criterios da Mecánica da Fractura no deseño de maquinaria. Identificar e interpretar as posibles causas de fallos dun material en función das condicións de servizo. Propor solucións para evitar o fallo de compoñentes.Adquirir habilidades para a realización e interpretación de ensaios non destrutivos. Analiza e propón solucións operativas a problemas no ámbito da enxeñaría de materiais. Demostrar capacidades de comunicación e traballo en equipo. Identifica as propias necesidades de información e utiliza os medios, espazos e servizos dispoñibles para deseñar e executar procuras adecuadas ao ámbito temático. Leva a termo os traballos encomendados a partir das orientacións básicas dadas polo profesor, decidindo a duración das partes, incluíndo achegas persoais e ampliando fontes de información. Profundar nas técnicas de verificación de máquina-ferramenta. Caracterizar e Modelar máquinas para o conformado. Saber analizar con métodos avanzados a influencia do procesamento de material na selección e uso de equipos para o conformado. Saber facer unha Análise CAE de procesos de conformado	50	CG4 CG5 CG6 CG7 CG8	CE25 CE26	CT5 CT7 CT8 CT9 CT10 CT14 CT17 CT20

Seminario	As actividades formativas de carácter práctico avaliaranse segundo os criterios de asistencia e grao de participación, e informes (20%) e traballos presentados (30%). Resultados de aprendizaxe: Coñecer os requirimentos dos distintos compoñentes para a realización dunha selección adecuada de materiais. Coñecer o proceso experimental utilizado cando se traballa con maquinas de alta velocidade (HSM) para fabricación por mecanizado. Coñecer as actuais tecnoloxías para mellora das propiedades superficiais: resistencia ao desgaste e á corrosión. Adquirir criterios para a selección do tratamento de superficies máis adecuado para alongar a vida en servizo dun compoñente. Identificar e interpretar as posibles causas de fallos dun material en función das condicións de servizo. Propor solucións para evitar o fallo de compoñentes. Adquirir habilidades para a realización e interpretación de ensaios non destrutivos. Demostrar capacidades de comunicación e traballo en equipo. Identifica as propias necesidades de información e utiliza os medios, espazos e servizos dispoñibles para deseñar e executar procuras adecuadas ao ámbito temático. Levar a termo os traballos encomendados a partir das orientacións básicas dadas polo profesor, decidindo a duración das partes, incluíndo achegas persoais e ampliando fontes de información. Profundar nas técnicas de verificación de máquina-ferramenta. Caracterizar e Modelar máquinas para o conformado. Saber analizar con métodos avanzados a influencia do procesamento de material na selección e uso de equipos para o conformado. Saber facer unha Análise CAE de procesos de conformado	50	CG4 CG5 CG6 CG8	CE25 CE26	CT5 CT7 CT8 CT9 CT10 CT17 CT20

Other comments on the Evaluation

Compromiso ético: Espérase que o alumno presente un comportamento ético adecuado. En caso de detectar un comportamento non ético (copia, plaxio, utilización de aparellos electrónicos non autorizados, por exemplo) considerarase que o alumno non reúne os requisitos necesarios para superar a materia. Neste caso a cualificación global no presente curso académico será de suspenso (0.0). Non se permitirá a utilización de ningún dispositivo electrónico durante as probas de avaliación salvo autorización expresa. O feito de introducir un dispositivo electrónico non autorizado na aula de exame será considerado motivo de non superación da materia no presente curso académico e a cualificación global será de suspenso (0.0). PRIMEIRA EDICIÓN OU PRIMEIRA CONVOCATORIA DE CADA CURSO: Os alumnos poden optar entre dous sistemas de avaliación: A. Sen avaliación continua: O estudante, neste caso debe facer unha proba de avaliación ou exame final que consta de dous partes correspondentes aos Contidos Temáticos 1 e 2: Materiais (1) e Tecnoloxías (2), ambas as coa mesma ponderación. A parte do exame correspondente ao Tema 1 de Materiais, incluirá preguntas de tipo test de elección múltiple e resposta única na que cada resposta errada resta a probabilidade de acertar (é dicir se son catro respostas posibles restaría 1/4 do valor da pregunta), preguntas de resposta curta e un exame práctico que avalía problemas ou exercicios da parte de prácticas do Tema 1. A parte do exame correspondente ao Tema 2 de Tecnoloxías, realizarase a través dun test (de ata 5 puntos sobre 10), con ata 20 preguntas que poden ser das clases de aula ou de prácticas, de elección múltiple e resposta única nas que cada resposta errada resta a probabilidade de acertar (é dicir se son catro respostas posibles restaría 1/4 do valor da pregunta) e dun exame (de ata 8 puntos sobre 10) que avalíará problemas e/ou exercicios que poden ser tanto da parte de aula como da de prácticas de laboratorio do Tema 2. B. Con avaliación continua. Este tipo de avaliación consta de dous partes: a) Exame final coas mesmas condicións que a avaliación tipo A pero cuxa nota só vale o 50 % da nota global e que constará igualmente de dous partes correspondentes aos Contidos Temáticos 1 e 2, respectivamente Materiais (1) e Tecnoloxías (2) cada un, á súa vez, co 50% do valor do exame. O exame do Bloque temático 1, ou de Materiais será só da parte de teoría, e incluirá preguntas curtas e preguntas tipo test, de elección múltiple e resposta única nas que cada resposta errada resta a probabilidade de acertar. O exame do Bloque temático 2, ou de

Tecnoloxías, conterá un test de ata 20 preguntas de elección múltiple nas que as respostas erradas restarán (se son catro respostas posibles e unha resposta única, restaría 1/4 do valor da pregunta) xunto a problemas e/ou cuestións da parte teórica e/ou práctica do Tema 2. b) Nota de prácticas, 50% da nota global: 4 puntos sobre 10 a través de asistencia, participación e informes recibidos e os outros 6 puntos en función de memorias e/ou proxectos sobre as prácticas e/ou contidos propostos de desenvolvemento de compoñentes, equipos ou mellora de procesos. Para aprobar a materia, e independentemente do Sistema de Avaliación (A ou B) que sexa elixido, deberase obter unha cualificación mínima de 4 puntos en cada unha dos Bloques Temáticos 1 e 2: Materiais e Tecnoloxías, respectivamente, e, evidentemente, sempre que se alcance unha nota final mínima de 5 puntos. É dicir, para superar a materia será necesario alcanzar unha puntuación mínima dun 40% en cada un dos dous temas reflectidos no apartado "Contidos". Só sumaranse as dúas notas (Avaliación continua e Exame final teórico) se o estudante alcanzara ou superara un mínimo dun 40% no exame de cada bloque temático. Se o estudante non superou esta condición a nota final de cadansúa parte será como máximo de un 4.9 e non aprobará a materia. SEGUNDA (E/OU TERCEIRA) EDICIÓN ou CONVOCATORIA: Na segunda (e/ou terceira) edición (xullo e/ou outubro, que corresponda á docencia previa realizada durante o curso precedente) o sistema de avaliación limitarase unicamente á opción A das explicadas no caso de primeira convocatoria ou primeira edición. Só é posible elixir a opción B na priemira edicicón de cada ano académico e non se lle rcoñecerá ao estudante ningunha parte da materia de cursos previos.

Bibliografía. Fontes de información

Basic Bibliography

Ashby, Michael F., **Materials selection in mechanical design**, Butterworth-Heinemann,

Kalpakjian / Shmid, **Manufacturing Processes for engineering materials**, 4ª, Pearson Education, 2003

Complementary Bibliography

Groover, Mikell P., **Fundamentos de Manufactura Moderna: Materiales, procesos y Sistemas**, 3ª, Prentice Hall, 2007

Otero Huerta, Enrique, **Corrosión y Degradación de materiales**, Síntesis,

Sreven R. Lampman, **Fatigue and fracture**, ASM International,

Shaw, Milton C., **Metal cutting principles**, 2ª, Oxford University Press, 2005

Arnone, Miles, **Mecanizado alta velocidad y gran precisión**, 1ª, El Mercado Técnico, S.L., 2000

Blanco, Julio, **Prensas y procesos en matricería : corte fino, automatización, robótica y sistemas de seguridad**, 1ª, Prensa XXI, 1982

del Río, Jesús, **Deformación plástica de los materiales : la forja y la laminación en calient**, Gustavo Gili,

Recomendacións

Subjects that it is recommended to have taken before

Ciencia e tecnoloxía dos materiais/V12G380V01301
Fundamentos de sistemas e tecnoloxías de fabricación/V12G380V01305
Enxeñaría de fabricación e calidade dimensional/V12G380V01604
Enxeñaría de materiais/V12G380V01504

Other comments

Para matricularse nesta materia é necesario ter superado ou ben estar matriculado de todas as materias dos cursos inferiores ao curso no que está emprazada esta materia

En caso de discrepancia na información contida nesta guía entenderase que prevalece a versión editada en castelán.

Plan de Continxencias

Description

=== MEDIDAS EXCEPCIONAIS PLANIFICADAS ===
Ante a incerta e imprevisible evolución da alerta sanitaria provocada pola COVID-19, a Universidade de Vigo establece unha planificación extraordinaria que se activará no momento en que as administracións e a propia institución determíneno atendendo a criterios de seguridade, saúde e responsabilidade, e garantindo a docencia nun escenario non presencial ou parcialmente presencial. Estas medidas xa planificadas garanten, no momento que sexa preceptivo, o desenvolvemento da docencia dun modo máis áxil e eficaz ao ser coñecido de antemán (ou cunha ampla antelación) polo alumnado e o profesorado a través da ferramenta normalizada e institucionalizada das guías docentes.

=== ADAPTACIÓN DAS METODOLOXÍAS ===
* Metodoloxías
Adecuaranse aos medios telemáticos que se poñan a disposición do profesorado, ademais da documentación facilitada a través de FAITIC, correo electrónico e Campus Remoto.

* Mecanismo non presencial de atención ao alumnado (titorías)

As titorías poderán desenvolverse de forma presencial (sempre que sexa posible garantir as medidas sanitarias) ou telemáticas (correo electrónico, campus remoto ou foros faitic) baixo a modalidade de concertación previa. Farase unha adecuación metodolóxica ao alumnado de risco, facilitándolle información específica adicional, de acreditarse que non pode ter acceso aos contidos impartidos de forma convencional.

=== ADAPTACIÓN DA AVALIACIÓN ===
Na medida do posible, manteranse as probas presenciais adecuándoas á normativa sanitaria vixente. As probas desenvolveranse de forma presencial salvo Resolución Reitoral que indique que se deben facer de forma non presencial, realizándose desta forma a través das distintas ferramentas postas a disposición do profesorado. Aquelas probas non realizables de forma telemática supliranse por outras (entregas de traballo autónomo guiado, etc.)

* Modificación do peso de avaliación continua.

Avaliación continua [Peso anterior 50%] [Peso Proposto 60%]

IDENTIFYING DATA				
Motores e máquinas térmicos				
Subject	Motores e máquinas térmicos			
Code	V12G380V01913			
Study programme	Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	9	Optional	4	1c
Teaching language	Castelán			
Department	Enxeñaría mecánica, máquinas e motores térmicos e fluídos			
Coordinator	Diz Montero, Rubén			
Lecturers	Diz Montero, Rubén			
E-mail	rubendiz@uvigo.es			
Web				
General description				

Competencias	
Code	
CG3	CG3 Coñecemento en materias básicas e tecnolóxicas que os capacite para a aprendizaxe de novos métodos e teorías, e os dote de versatilidade para adaptarse a novas situacións.
CT2	CT2 Resolución de problemas.
CT7	CT7 Capacidade para organizar e planificar.
CT9	CT9 Aplicar coñecementos.
CT10	CT10 Aprendizaxe e traballo autónomos.
CT15	CT15 Obxectivación, identificación e organización.
CT17	CT17 Traballo en equipo.
CT20	CT20 Capacidade para comunicarse con persoas non expertas na materia.

Resultados de aprendizaxe		
Learning outcomes		Competences
Coñecer a base tecnolóxica sobre a que se apoian as investigacións máis recentes en motores térmicos	CG3	CT2 CT7
Coñecer os tipos, o funcionamento e as aplicacións de máquinas e motores e térmicos		CT9
Dar explicacións sobre as implicacións #ambiental e de sustentabilidade dun determinado problema.		CT10 CT15
Realizar a resolución de problemas inherentes a máquinas térmicas, tanto mecánicos, como de emisións contaminantes		CT17 CT20
Realizar análises experimentais para avaliar as curvas características de funcionamento de motores térmicos nos diferentes estados de carga.		
Realizar deseños, cálculos e ensaios xustificando os seus resultados, extraendo conclusións e Redactar informes respecto diso		
Coñecer os sistemas de produción de calor. Coñecer e calcular caldeiras, *quemadores fornos e *secaderos		
Profundar nas técnicas de aproveitamento de combustibles fósiles e combustibles renovables para o seu uso en caldeiras		
Comprender os aspectos básicos dunha bomba de calor		
Coñecer e calcular as propiedades e procesos termodinámicos de *refrigerantes. Coñecer os sistemas de produción de frío e o seu deseño e cálculo		
Estudar os procesos e equipos dos diversos sistemas utilizados para a conversión ou aproveitamento das enerxías renovables en calor		

Contidos	
Topic	
1. Introdución aos Motores Térmicos	1.1 Presentación da materia 1.2 Definicións fundamentais
2. Características dos *MCIA	2.1 Clasificación dos motores térmicos 2.2 Fundamentos dos motores de combustión interna alternativos (*MCIA) 2.3 Partes dos *MCIA 2.4 Nomenclatura e parámetros fundamentais

3. Ciclo de aire	3.1 Procesos termodinámicos 3.2 O Ciclo *Otto 3.3 O Ciclo dual ou *Sabathé 3.4 O Ciclo Diesel
4. O Ciclo real	4.1 A mestura de gas real 4.2 Evolución do coeficiente *adiabático 4.3 Perdas de bombeo 4.4 Perdas de combustión 4.5 Perdas de expansión 4.6 Factor de Calidade do Ciclo
5. Procesos de renovación da carga en motores 4 tempos	5.1 O sistema de distribución 5.2 O rendemento *volumétrico 5.3 Perdidas de carga no proceso de renovación 5.4 Calado real da distribución 5.5 Sistemas de distribución variable 5.6 Sistemas de admisión dinámicos
6. Procesos de renovación da carga en motores 2 tempos	6.1 Renovación ideal nos *motoes de 2 tempos 6.2 Sistemas de varrido 6.3 Sistemas de admisión a *cárter 6.4 Influencias das ondas de presión
7. *Sobrealimentación	7.1 Vantaxes da *sobrealimentación nos *MCIA 7.2 *Sobrealimentadores *volumétricos 7.3 *Turboalimentadores 7.4 *Intercooler 7.5 Sistemas dinámicos (*Comprex)
8. Combustión *MEP	8.1 *Dosado e mestura dos *MEP 8.2 Curvas características 8.3 *Carburador básico 8.4 Sistema de inxección 8.5 Control en lazo pechado (sonda *lambda) 8.6 Fases de *combsutión *MEP 8.7 Combustión anormal: picado 8.8 Combustión anormal: aceso superficial 8.9 Cámaras de combustión 8.10 Factores influentes na combustión *MEP
9. Combustión *MEC	9.1 Introdución 9.2 Fases de combustión en *MEC 9.3 Factores influentes 9.4 Tipos de inxección 9.5 Sistemas de inxección 9.6 Tendencias futuras
10. *Turbomáquinas térmicas	10.1 Ciclo *Brayton 10.2 Partes da *turbina de gas 10.3 *Compresores 10.4 Cámara de combustión 10.5 *Turbina 10.6 Alternativas construtivas
11. Circuítos auxiliares en *MCIA	11.1 Sistema de refrixeración 11.2 Sistema de *lubricación
12. Emisións de contaminantes	12.1 Emisións dos *MEP 12.2 Emisións dos *MEC 12.3 Normativa anticontaminación (EURO) 12.4 Catalizador 12.5 Sistemas *EGR 12.6 Sonda *lambda
13. Outros motores térmicos	13.1 Motor Rotativo *Wankel 13.2 Motor *Stirling 13.3 Tendencias modernas en *motopropulsores (*HCCI, *híbridos...) 13.4 Combustibles modernos
14. Caldeiras e fornos	14.1 Clasificación das caldeiras 14.2 Tipos de intercambiadores 14.3 Caldeiras de leito fixo 14.4 Caldeiras de leito *fluidizado 14.5 Perdas de calor en caldeiras 14.6 Fornos industriais

15. Produción de Frío	15.1 Introdución 15.2 Ciclo de *compresión Simple 15.3 Refrixeración por *compresión simple en varias etapas 15.4 Bomba de Calor 15.5 Outros sistemas de refrixeración: Absorción 15.6 *Refrigerantes

Planificación			
	Class hours	Hours outside the classroom	Total hours
Lección maxistral	42	89	131
Prácticas de laboratorio	24	10	34
Traballo tutelado	0	30	30
Resolución de problemas	10	20	30
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente	
	Description
Lección maxistral	Explicación maxistral clásica en lousa apoiada con presentación en transparencias, vídeos e calquera material que o docente considere útil para facer comprensible o temario da materia.
Prácticas de laboratorio	Realización de prácticas de laboratorio aplicadas. As actividades consistirán en desmontar diversos motores e/ou máquinas térmicos, utilización de banco de potencia, medición de emisións...
Traballo tutelado	(Opcionalmente e dependendo do desenvolvemento da materia) Realización de traballos tutelados individuais e en grupo. Dentro desta actividade inclúese tamén unha presentación dos devanditos traballos ante a clase e a súa posterior avaliación.
Resolución de problemas	Resolución de exercicios e casos prácticos que se proporán como breves retos durante o desenvolvemento da materia.

Atención personalizada	
Methodologies	**Description**
Lección maxistral	Solución de dúbidas o final da clase e en horario de titorías.
Prácticas de laboratorio	Aclaración de dúbidas o final de cada sesión e en horario de titorías.
Traballo tutelado	Atención en horario de titorías.
Resolución de problemas	Atención en horario de titorías.

Avaliación				
	Description	Qualification	Evaluated Competencess	
Lección maxistral	Exame de preguntas de resposta curta e problemas baseados na materia impartida (*min...)	75	CG3	CT2 CT7 CT9 CT10 CT15 CT17 CT20
Prácticas de laboratorio	As prácticas de laboratorio serán avaliadas en función de memorias sobre o contido de algunhas delas.	10	CG3	CT9 CT10 CT17
Traballo tutelado	Traballos realizados polo alumno de forma individual ou en grupo...	15	CG3	CT2 CT7 CT9 CT10 CT15 CT17 CT20

Other comments on the Evaluation

Por acordo da Comisión Permanente da Escola de Enxeñaría Industrial:

Compromiso ético:

espérase que o alumno presente un comportamento ético adecuado. No caso de detectar un comportamento non ético (copia, plaxio, utilización de aparellos electrónicos non autorizados, e outros) considerarase que o alumno non reúne os requisitos necesarios para superar a materia. Neste caso a cualificación global no presente curso académico será de

suspenso (0.0).

O criterio para a avaliación en xullo será o mesmo que para a convocatorio ordinaria.

Bibliografía. Fontes de información

Basic Bibliography

Moran J and Shapiro H, **Fundamentos de Termodinámica Técnica**, Ed. Reverté,

Payri F. and Desantes J.M., **Motores de combustión interna alternativos**, Reverté,

Muñoz M. y Payri F, **Motores de combustión interna alternativos**, Publicaciones de la UP Valencia,

Complementary Bibliography

Heywood, J.B., **Internal combustion engines fundamentals**, McGraw-Hill,

Mollenhauer K. y Tschöke H, **Handbook of Diesel Engines.**, Ed. Springer,

Agüera Soriano J., **Termodinámica Lógica y Motores Térmicos**, Ed. Ciencia 3,

Gordon P. Blair, **Design and simulation of four-stroke engines**, Editado por SAE Internacional,

Taylor C.F., **The internal combustion engine in theory and practice: vol. 1. Thermodynamics, fluid flow, performance.**, Editorial MIT press,

Taylor C.F., **The internal combustion engine in theory and practice: vol. 2. Combustions, fuels, materials, design**, Editorial MIT press,

Recomendacións

Subjects that it is recommended to have taken before

Teoría de máquinas e mecanismos/V12G380V01306
Termodinámica e transmisión de calor/V12G380V01302
Enxeñaría térmica I/V12G380V01501

Other comments

Por acordo da Comisión Permanente da Escola de Enxeñaría Industrial:

Requisitos: Para matricularse *nesta materia *é necesario *ter superado *ou *ben estar matriculado de todas *as materias dous cursos inferiores *ao curso non que está *emprazada esta materia."

En caso de discrepancias prevalecerá a versión en castelán de está guía.

Plan de Continxencias

Description

Os contidos e os resultados de aprendizaxe non deberán ser modificados para poder garantir o recollido nas memorias da titulación. Debe tratarse de axustar os materiais, titorías e as metodoloxías docentes para tratar de acadar estes resultados. Trátase dun aspecto de grande importancia para a superación dos procesos de acreditación a que están sometidas as diferentes titulacións. E dicir, o plan de continxencia debe basearse nun desenvolvemento da materia, adaptando as metodoloxías e os materiais, na procura do cumprimento dos resultados de aprendizaxe de todo o alumnado.

As metodoloxías docentes se impartirán, de ser necesario, adecuándoas ós medios telemáticos que se poñan a disposición do profesorado, ademais da documentación facilitada a través de FAITIC e outras plataformas, correo electrónico, etc.

Cando non sexa posible a docencia presencial, na medida do posible, primarase a impartición dos contidos teóricos por medios telemáticos así como aqueles contidos de prácticas de resolución de problemas, aula de informática, e outros, que poidan ser virtualizados ou desenvolvidos polo alumnado de xeito guiado, intentado manter a presencialidade para as prácticas experimentais de laboratorio, sempre que os grupos cumpran coa normativa establecida no momento polas autoridades pertinentes en materia sanitaria e de seguridade. No caso de non poder ser impartida de forma presencial, aqueles contidos non virtualizables se impartirán ou suplirán por outros (traballo autónomo guiado, etc.) que permitan acadar igualmente as competencias asociados a eles. As titorías poderán desenvolverse indistintamente de forma presencial (sempre que sexa posible garantir as medidas sanitarias) ou telemáticas (e-mail e outros) respectando ou adaptando os horarios de titorías previstos. Asemade, farase unha adecuación metodolóxica ó alumnado de risco, facilitándolle información específica adicional, de acreditarse que non pode ter acceso ós contidos impartidos de forma convencional.

Información adicional sobre a avaliación: manteranse aquelas probas que xa se veñen realizando de forma telemática e, na

medida do posible, manteranse as probas presenciais adecuándoas á normativa sanitaria vixente. As probas se desenvolverán de forma presencial salvo Resolución Reitoral que indique que se deben facer de forma non presencial, realizándose dese xeito a través das distintas ferramentas postas a disposición do profesorado. Aquelas probas non realizables de forma telemática se suplirán por outros (entregas de traballo autónomo guiado, etc.)

IDENTIFYING DATA				
Deseño de máquinas hidráulicas e sistemas oleopneumáticos				
Subject	Deseño de máquinas hidráulicas e sistemas oleopneumáticos			
Code	V12G380V01914			
Study programme	Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	4	2c
Teaching language	Galego			
Department	Enxeñaría mecánica, máquinas e motores térmicos e fluídos			
Coordinator	Concheiro Castiñeira, Miguel			
Lecturers	Concheiro Castiñeira, Miguel			
E-mail	mconcheiro@uvigo.es			
Web				
General description				

Competencias	
Code	
CG3	CG3 Coñecemento en materias básicas e tecnolóxicas que os capacite para a aprendizaxe de novos métodos e teorías, e os dote de versatilidade para adaptarse a novas situacións.
CT3	CT3 Comunicación oral e escrita de coñecementos.
CT6	CT6 Aplicación da informática no ámbito de estudo.
CT10	CT10 Aprendizaxe e traballo autónomos.
CT16	CT16 Razoamento crítico.
CT17	CT17 Traballo en equipo.
CT20	CT20 Capacidade para comunicarse con persoas non expertas na materia.

Resultados de aprendizaxe		
Learning outcomes		Competences
Capacidade para calcular e proxectar máquinas de fluídos, as súas instalacións e a súa explotación	CG3	CT3 CT6 CT10 CT16 CT17 CT20
Capacidade para proxectar instalacións *neumáticas e hidráulicas e para *dimensionar os seus elementos	CG3	CT3 CT6 CT10 CT16 CT17 CT20

Contidos	
Topic	
Introdución	1.Introdución 1.1.Teoría xeral do deseño de máquinas. 1.2.Aplicación ao deseño de máquinas hidráulicas e sistemas Oleoneumáticos
Deseño de turbobombas hidráulicas	2.1.Deseño e cálculo de turbobombas radiales ou centrífugas, axiales e diagonales. 2.2.Elementos constitutivos das turbobombas: Deseño, cálculo e materiais de fabricación. 2.3.Selección e regulación de bombas

Deseño de turbinas de acción e reacción	3.1.TURBINAS DE ACCIÓN 3.1.1Deseño e cálculo das turbinas de acción. Turbinas PELTON 3.2.TURBINAS DE REACCIÓN 3.2.1.Deseño e cálculo das turbinas de reacción axiales. Turbinas KAPLAN 3.2.2.Deseño e cálculo das turbinas de reacción radiales. Turbinas FRANCIS 3.2.3.Elementos constitutivos das turbinas hidráulicas: Deseño, cálculo e materiais de fabricación.
Turbomáquinas compostas	4.1.Transmisións hidráulicas
Deseño de ventiladores	5.1.Introdución aos ventiladores. 5.2.Deseño de ventiladores.
Deseño e selección de elementos pneumáticos	Deseño de MNDP Máquinas Neumáticas de Desprazamento Positivo: Compresores, Motores e Actuadores lineais
Deseño e selección de elementos hidráulicos	Deseño de válvulas hidraulicas: Válvulas e elementos de control, constitutivos dos circuítos hidráulicos Deseño de elementos de hidráulica: Deseño de Elementos Auxiliares dos Circuítos Hidráulicos
NEUMÁTICA E HIDRÁULICA	Circuitos e instalaciones neumáticas Circuitos e instalaciones electroneumáticas Circuitos e instalaciones hidráulicas
PRACTICAS:	Práctica de Electroneumática: 1. Introdución aos sistemas pneumáticos: Descrición dos sistemas pneumáticos e os seus compoñentes I. Circuítos básicos I. Control de cilindros. 2. Descrición dos sistemas electroneumáticos e os seus compoñentes II. Circuítos básicos II. Uso de válvulas neumáticas. Síntese de funcións lóxicas con sistemas pneumáticos. Mando pneumático 3. Resolución de problemas propostos Práctica de MDP Actuadores Neumáticos Práctica de MDP Identificación de elementos y máquinas Práctica de MDP Bomba de Pistón

Planificación			
	Class hours	Hours outside the classroom	Total hours
Lección maxistral	28	28	56
Resolución de problemas	11	31	42
Prácticas de laboratorio	5	0	5
Seminario	4	0	4
Traballo tutelado	0	20	20
Traballo	0	20	20
Exame de preguntas de desenvolvemento	3	0	3
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente	
	Description
Lección maxistral	Explícanse os fundamentos de cada tema para posterior resolución de problemas prácticos. Poderanse realizar actividades como: Sesión maxistral Lecturas Esquemas Conferencias Presentación oral
Resolución de problemas	Aplicaranse os conceptos desenvolvidos de cada tema á solución de exercicios. Inclúe actividades tales como: Lecturas Seminarios Solución de problemas Aprendizaxe colaborativo Estudo de casos prácticos

Prácticas de laboratorio	Aplicaranse os conceptos desenvolvidos de cada tema á realización de prácticas de laboratorio. Fundamentalmente, realizaranse actividades de experimentación, aínda que tamén poderán realizarse: Casos prácticos Simulación Solución de problemas Aprendizaxe colaborativo
Seminario	Exporanse e comentaranse as actividades e traballos grupais co resto de compañeiros buscando un clima de recíproca colaboración
Traballo tutelado	levará a cabo a realización dos traballos por parte do alumno. A temática dos mesmos acordarase co titor

Atención personalizada

Methodologies	Description
Traballo tutelado	Horario de *tutorías: (A principio de curso subiranse a *FAITIC os horarios correspondentes a cada profesor)
Tests	**Description**
Traballo	Horario de *tutorías: (A principio de curso subiranse a *FAITIC os horarios correspondentes a cada profesor)

Avaliación

	Description	Qualification	Evaluated Competences
Prácticas de laboratorio	Memoria escrita das actividades realizadas nas sesións de laboratorio, incluíndo resultados da experimentación	20	CT3 CT10 CT16 CT17 CT20
Traballo	Memoria escrita do traballo realizado polo alumno, achega do tema establecido nas clases polo titor. Os traballos estarán relacionados co deseño de máquinas e instalacións de fluídos	20	CT3 CT6 CT10 CT16 CT17 CT20
Exame de preguntas de desenvolvemento	Exame final que poderán constar de: cuestións teóricas cuestións prácticas exercicios/problemas tema a desenvolver	60	CT3 CT6 CT10 CT16 CT17 CT20

Other comments on the Evaluation

Evaluación continua: representa o 40% da nota. Salvo indicación oficial por parte do centro da renuncia do alumno á avaliación continua, o alumno cursa a materia en devandita modalidade. A nota da avaliación continua non se gardará dun curso escolar a outro para os alumnos repetidores.

Para superar a materia será necesario alcanzar un mínimo do 30% da nota en cada unha das 3 probas descritas

Bibliografía. Fontes de información

Basic Bibliography

C. Paz, E. Suárez, M.Concheiro, M. Conde, **Turbomáquinas hidráulicas**, 978-84-8158-808-8, Servizo de Publicacións da Universidade de Vigo, 2019

Complementary Bibliography

C. Mataix., **Turbomáquinas hidráulicas**, ICAI,

Vickers, **Manual de oleohidráulica industrial**,

Festo, **Neumática. Manual de estudio**,

Panzer Beitler, **Tratado práctico de oleohidráulica**, BLUME,

M Hernández, **Mecánica de fluidos y máquinas hidráulicas**, UNED,

H. Speich A. Bucciarelli, **Oleodinámica**, GUSTAVO GILI,

De Lamadrid, **Máquinas hidráulicas. Turbinas Pelton. Bombas centrífugas**, ETSII MADRID,

Recomendacións

Subjects that it is recommended to have taken before

Mecánica de fluídos/V12G380V01405
Máquinas de fluídos/V12G380V01505

Other comments

Requisitos:

Para matricularse nesta materia é necesario superar ou ben estar matriculado de todas as materias dos cursos inferiores ao curso no que está situada esta materia.

En caso de discrepancias, prevalecerá a versión en castelán desta guía.

Plan de Continxencias

Description

=== MEDIDAS EXCEPCIONAIS PLANIFICADAS ===
Ante a incerta e imprevisible evolución da alerta sanitaria provocada pola COVID- 19, a Universidade establece una planificación extraordinaria que se activará no momento en que as administracións e a propia institución o determinen atendendo a criterios de seguridade, saúde e responsabilidade, e garantindo a docencia nun escenario non presencial ou non totalmente presencial. Estas medidas xa planificadas garanten, no momento que sexa preceptivo, o desenvolvemento da docencia dun xeito mais áxil e eficaz ao ser coñecido de antemán (ou cunha ampla antelación) polo alumnado e o profesorado a través da ferramenta normalizada e institucionalizada das guías docentes DOCNET.

=== ADAPTACIÓN DAS METODOLOXÍAS ===
* Metodoloxías docentes que se manteñen
Lección maxistral
Resolución de problemas

* Metodoloxías docentes que se modifican
Prácticas de laboratorio, modificarase a parte experimental e complementarase con simulación de circuitos electroneumáticos

* Mecanismo non presencial de atención ao alumnado (titorías)
Titorías telemáticas

* Modificacións (se proceder) dos contidos a impartir
Non procede

* Bibliografía adicional para facilitar a auto-aprendizaxe
Non procede

* Outras modificacións

=== ADAPTACIÓN DA AVALIACIÓN ===
* Probas xa realizadas
Proba XX: [Peso anterior 00%] [Peso Proposto 00%]
...

* Probas pendentes que se manteñen
Proba XX: [Peso anterior 00%] [Peso Proposto 00%]
...

* Probas que se modifican
[Practicas experimentais] => [Prácticas simuladas e resolución de exercicios]

* Novas probas

* Información adicional
Mantéñense os criterios de avaliación adecuando a realización das probas, no caso de ser necesario e por indicación en

IDENTIFYING DATA				
Deseño mecánico asistido				
Subject	Deseño mecánico asistido			
Code	V12G380V01915			
Study programme	Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	4	2c
Teaching language				
Department	Enxeñaría mecánica, máquinas e motores térmicos e fluídos			
Coordinator	Peláez Lourido, Gerardo			
Lecturers	Peláez Lourido, Gerardo			
E-mail	gpelaez@uvigo.es			
Web				
General description	ESTA MATERIA PRESUPÓN CURSAR DESEÑO DE *MAQUINAS-*I E *II. PROPORCIONANDO Ao ALUMNO Os COÑECEMENTOS DOS FUNDAMENTOS *BASICOS DAS *TECNICAS COMPUTACIONAIS DO DESEÑO *MECANICO: A *DINAMICA DOS SISTEMAS *MULTICUERPO E O *METODO DOS *ELEMNTOS *FINITOS.			

Competencias	
Code	
CG1	CG1 Capacidade para a redacción, sinatura e desenvolvemento de proxectos no ámbito da enxeñaría industrial, na especialidade de Mecánica, que teñan por obxecto, a construción, reforma, reparación, conservación, demolición, fabricación, instalación, montaxe ou explotación de: estruturas, equipos mecánicos, instalacións enerxéticas, instalacións eléctricas e electrónicas, instalacións e plantas industriais, e procesos de fabricación e automatización.
CG4	CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial na especialidade de Mecánica.
CG5	CG5 Coñecementos para a realización de medicións, cálculos, valoracións, taxacións, peritaxes, estudos, informes, planes de labores e outros traballos análogos.
CG6	CG6 Capacidade para o manexo de especificacións, regulamentos e normas de obrigado cumprimento.
CG9	CG9 Capacidade de organización e planificación no ámbito da empresa, e outras institucións e organizacións.
CG10	CG10 Capacidade para traballar nun medio multilingüe e multidisciplinar.
CG11	CG11 Coñecemento, comprensión e capacidade para aplicar a lexislación necesaria no exercicio da profesión de Enxeñeiro Técnico Industrial.
CE19	CE19 Coñecementos e capacidades para aplicar as técnicas de enxeñaría gráfica.
CE20	CE20 Coñecementos e capacidades para o cálculo, deseño e ensaio de máquinas.
CT2	CT2 Resolución de problemas.
CT6	CT6 Aplicación da informática no ámbito de estudo.
CT9	CT9 Aplicar coñecementos.
CT10	CT10 Aprendizaxe e traballo autónomos.
CT17	CT17 Traballo en equipo.

Resultados de aprendizaxe			
Learning outcomes	Competences		
Coñecer e aplicar as técnicas computacionais de modelado 2D e 3D ao deseño mecánico.	CG1	CE19	CT2
Coñecer e aplicar as técnicas computacionais para a xeración de documentación para fabricación, montaxe e funcionamento de máquinas e construcións industriais.	CG4 CG5 CG6	CE20	CT6 CT9 CT10
Coñecer e aplicar as técnicas computacionais para o cálculo clásico de deseño de máquinas.	CG9		CT17
Coñecer e aplicar as técnicas computacionais de análise numérica no deseño de máquinas	CG10 CG11		

Contidos	
Topic	
*INTRODUCCION Ao DESEÑO ASISTIDO	-CALCULO COMPUTACIONAL APLICADO Ao DESEÑO *MECANICO.
MODELADO COMPUTACIONAL DUN SISTEMA *MECANICO.	-COMPOÑENTES *BASICOS DUN SISTEMA. -MODELADO DE ADOITADOS. -MODELADO DE *LIGADURAS *GEOMETRICAS. -MODELADO DE FORZAS. -FORZAS DE *LIGADURA. *MULTIPLICADORES DE *LAGRANGE.

*CINEMATICA COMPUTACIONAL	-*ANALISIS DOS MECANISMOS POR COMPUTADOR. -*DETERMINACION DA *POSICION, VELOCIDADE E *ACELERACION. -O PROBLEMA DA *CONDICION INICIAL. -*METODOS *NUMERICOS DE *RESOLUCION.
*DINAMICA COMPUTACIONAL	-FUNDAMENTOS E BASES PREVIAS. -*DINAMICA 2-D E 3-D -SISTEMA *ALGEBRAICO-*DIDERENCIAL -MODELADO DE RESISTENCIAS PASIVAS -MOTOR DE *INTAGRACION.*METODOS DE PASO *CTE. E PASO VARIABLE. -*ANALISIS *DINAMICO DO MOVEMENTO NA CONTORNA DO EQUILIBRIO. -*DETERMINACION DA MATRIZ INERCIA, *ELASTICA E *AMORTIGUACION -*DINAMICA DO IMPACTO -*DINAMICA DO CONTACTO.
*METODO DOS ELEMENTOS *FINITOS	-COORDENADAS *NODALES. -ECUACIÓNS E *DEFINICION DE ELEMENTOS. -*CONECTIVIDAD ENTRE ELEMENTOS. -*IMPOSICION DE *LIGADURAS. -*DETERMINACION DA MATRIZ INERCIA, *ELASTICA E *AMOTIGUAMIENTO.

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	19	58	77
Prácticas de laboratorio	30	36	66
Exame de preguntas de desenvolvemento	2	0	2
Informe de prácticas, prácticum e prácticas externas	0	5	5

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

Metodoloxía docente

	Description
Lección maxistral	CLASE MAXISTRAL NA QUE SE EXPOÑEN Os CONTIDOS *TEORICOS-*PRACTICOS POR MEDIOS TRADICIONAIS (LOUSA) E RECURSOS MULTIMEDIA.
Prácticas de laboratorio	*REALIZACION DE TAREFAS PRACTICAS EN LABORATORIO DOCENTE

Atención personalizada

Methodologies	**Description**
Lección maxistral	
Prácticas de laboratorio	
Tests	**Description**
Exame de preguntas de desenvolvemento	
Informe de prácticas, prácticum e prácticas externas	

Avaliación

	Description	Qualification	Evaluated Competencess		
Exame de preguntas de desenvolvemento	*EVALUACION DOS COÑECEMENTOS *ADQUIRDOS MEDIANTE UN EXAME *TEORICO-PRACTICO	70	CG1 CG4 CG5 CG6 CG9 CG10 CG11	CE19 CE20	CT2 CT6 CT9 CT10 CT17
Informe de prácticas, prácticum e prácticas externas	AVALIÁSESE A *REALIZACION DAS MEMORIAS DE PRACTÍCALAS REALIZADAS NO CURSO.	30	CG1 CG4 CG5 CG6 CG9 CG10 CG11	CE19 CE20	CT2 CT6 CT9 CT10 CT17

Other comments on the Evaluation

A MATERIA APROBÁSESE SI OBTENSE UNHA *CALIFICACION IGUAL Ou MAIOR QUE UN CINCO COMO NOTA FINAL, ENTRE&*nbsp;A ASISTENCIA Ao LABORATORIO, As MEMORIAS DE CADA PRACTICA E TRABALLOS TUTELADOS. PARTE DO

EXAME PODE SER DERIVADO Á *REALIZACION DE MÁIS ACTIVIDADES E/Ou TRABALLOSPara os que non sigan a avaliación continua realizarán un exame distinto aos que si a sigan sobre toda a materia.ético:

Bibliografía. Fontes de información

Basic Bibliography

AHMED A. SHABANA, **DYNAMICS OF MULTIBODY SYSTEMS**, 1998,

Complementary Bibliography

P.NIKRAVESH, **PLANAR MULTIBODY DYNAMICS**, 2008,

Recomendacións

Subjects that it is recommended to have taken before

Teoría de máquinas e mecanismos/V12G380V01306
Deseño de máquinas I/V12G380V01304
Deseño de máquinas II/V12G380V01911

Other comments

Requisitos:

Para matricularse nesta materia é necesario superar ou ben estar matriculado de todas as materias dos cursos inferiores ao curso no que está situada esta materia.

En caso de discrepancias, prevalecerá a versión en castelán desta guía.

Plan de Continxencias

Description

Mantéñense os contidos e os criterios de avaliación, adecuándose as metodoloxías e a tipoloxía de probas aos medios *telemáticos que se poñan a disposición, en caso de ser necesario.

IDENTIFYING DATA				
Estruturas de formigón				
Subject	Estruturas de formigón			
Code	V12G380V01921			
Study programme	Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	4	1c
Teaching language	Castelán			
Department	Enxeñaría dos materiais, mecánica aplicada e construción			
Coordinator	Caamaño Martínez, José Carlos			
Lecturers	Caamaño Martínez, José Carlos			
E-mail	jccaam@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	Coñecer os fundamentos do comportamento dos elementos de formigón estrutural, comprendendo os criterios da normativa. Conseguir un adecuado dominio práctico do dimensionamento e a comprobación dos elementos estruturais principais, aplicando adecuadamente os conceptos e as normas.			

Competencias	
Code	
CG4	CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial na especialidade de Mecánica.
CG5	CG5 Coñecementos para a realización de medicións, cálculos, valoracións, taxacións, peritaxes, estudos, informes, planes de labores e outros traballos análogos.
CG6	CG6 Capacidade para o manexo de especificacións, regulamentos e normas de obrigado cumprimento.
CG11	CG11 Coñecemento, comprensión e capacidade para aplicar a lexislación necesaria no exercicio da profesión de Enxeñeiro Técnico Industrial.
CE23	CE23 Coñecementos e capacidade para o cálculo e deseño de estruturas e construcións industriais.
CT2	CT2 Resolución de problemas.
CT5	CT5 Xestión da información.
CT8	CT8 Toma de decisións.
CT9	CT9 Aplicar coñecementos.
CT10	CT10 Aprendizaxe e traballo autónomos.
CT17	CT17 Traballo en equipo.

Resultados de aprendizaxe			
Learning outcomes	Competences		
Coñecer as bases do comportamento resistente do formigón estrutural. Coñecemento dos fundamentos do deseño e cálculo das estruturas de formigón.	CG5 CG6 CG11	CE23	CT5 CT10
Comprender os criterios en que se basea a normativa de estruturas de formigón, manexala e saber aplicala. Conseguir un adecuado dominio práctico do *dimensionado e a comprobación dos principais elementos estruturais de formigón.	CG4 CG5 CG6 CG11	CE23	CT2 CT5 CT8 CT9 CT10 CT17

Contidos	
Topic	
Introdución. Normativa e bases de cálculo	Introdución. Evolución histórica Normativa: CTE, Instrución EHE, Eurocódigos Modelado e análise Estados límite últimos Estados límite de servizo Durabilidade
Materiais	Compoñentes do formigón: áridos, cemento, auga, aditivos, adicións O formigón como material. Formigón en masa, armado e pretensado Aceiros para armaduras Designación das materiais Propiedades tecnolóxicas dos materiais

Estados Límite Últimos (I): seccións sometidas a tensións normais	Proceso de rotura Dominios de deformación Flexión pura e simple Flexión composta
Dimensionamento de elementos sometidos a flexión simple ou composta: Forxados e Pórticos. Adherencia e ancoraxe	Deseño e dimensionamento de alicerces. Armado lonxitudinal Deseño e dimensionamento de nervios, vigas e forxados. Armado lonxitudinal Adherencia e ancoraxe
Estados Límite Últimos (II): esforzos tanxenciais	Deseño e cálculo de elementos sometidos a esforzos tanxenciais. Método de bielas e tirantes.
Elementos estruturais de formigón armado	Deseño, dimensionamento e comprobación de elementos estruturais de formigón. Aplicación da normativa. Ménsulas curtas.

Planificación

	Class hours	Hours outside the classroom	Total hours
Prácticas de laboratorio	18	29	47
Resolución de problemas	0	18.5	18.5
Resolución de problemas de forma autónoma	0	19	19
Lección maxistral	32.5	30	62.5
Exame de preguntas de desenvolvemento	3	0	3

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

Metodoloxía docente

	Description
Prácticas de laboratorio	Actividade do alumno autónoma e *tutorizada
Resolución de problemas	
Resolución de problemas de forma autónoma	
Lección maxistral	Lección maxistral

Atención personalizada

Methodologies	Description
Resolución de problemas de forma autónoma	

Avaliación

	Description	Qualification	Evaluated Competencess		
Prácticas de laboratorio	Asistencia, participación activa e entrega en tempo e forma de toda a documentación solicitada. Requirese unha nota alomenos de 4'5 puntos no exame.	5	CG4 CG5 CG6 CG11	CE23	CT2 CT5 CT8 CT9 CT10 CT17
Resolución de problemas	Adicionalmente, ós alumnos que reúnan TODOS E CADA UO dos requisitos para a puntuación das 'Prácticas de laboratorio', E QUE ADEMÁIS ENTREGUEN NO SEU CASO TODOS OS PROBLEMAS PROPOSTOS PARA RESOLVER NA CASA, SUMARÍASELLES 0'5 PUNTOS Á NOTA	5	CG4 CG5 CG6 CG11	CE23	CT2 CT5 CT8 CT9 CT10
Resolución de problemas de forma autónoma	Durante o curso poderáse propor a elaboración de traballos relacionados coa materia. Neste caso, requerirás obter unha nota no exame maior ou igual ó 40% da calificación máxima posible no mesmo, para sumar a nota obtida no traballo. Os traballos puntuaránse en función da sua calidade sobre unha nota máxima de 1 punto sobre 10.	10	CG4 CG5 CG6 CG11	CE23	CT2 CT5 CT8 CT9 CT10
Exame de preguntas de desenvolvemento	Exame escrito de teoría e práctica nas datas establecidas polo centro Ponderación mínima sobre a nota final:	80	CG4 CG5 CG6 CG11	CE23	CT2 CT5 CT8 CT9 CT10

Other comments on the Evaluation

Compromiso ético: Se espera que el alumno presente un comportamiento ético adecuado. En el caso de detectar un comportamiento no ético (copia, plagio, utilización de aparatos electrónicos no autorizados, y otros) se considerará que el alumno no reúne los requisitos necesarios para superar la materia. En este caso la calificación global en el presente curso académico será de suspenso (0.0).

No se permitirá la utilización de ningún dispositivo electrónico durante las pruebas de evaluación salvo autorización expresa. El hecho de introducir un dispositivo electrónico no autorizado en el aula de examen será considerado motivo de no superación de la materia en el presente curso académico y la calificación global será de suspenso (0.0).

Bibliografía. Fontes de información

Basic Bibliography

Varios autores, **Instrucción de Hormigón Estructural EHE-08**, 2008, Ministerio de Fomento,

Morán Cabré, F.; García Meseguer, A.; Arroyo Portero, J.C., **Jiménez Montoya. Hormigón armado**, 14ª, Gustavo Gili,

Complementary Bibliography

Varios autores, **Guía de aplicación de la Instrucción de Hormigón Estructural. EDIFICACIÓN**, 2012, Ministerio de Fomento,

Calavera Ruiz, **Proyecto y cálculo de estructuras de hormigón**, Intemac, 2008

Varios, miembros de la Comisión Permanente del Hormigon, **La EHE explicada por sus autores**, Leynfor siglo XXI, 2000

Villodre Roldán, **Ejercicios prácticos de hormigón armado**, Universidad de Alicante, 2000

Recomendacións

Plan de Continxencias

Description

=== MEDIDAS EXCEPCIONAIS PLANIFICADAS ===
Ante a incerta e imprevisible evolución da alerta sanitaria provocada pola COVID- 19, a Universidade establece una planificación extraordinaria que se activará no momento en que as administracións e a propia institución o determinen atendendo a criterios de seguridade, saúde e responsabilidade, e garantindo a docencia nun escenario non presencial ou non totalmente presencial. Estas medidas xa planificadas garanten, no momento que sexa preceptivo, o desenvolvemento da docencia dun xeito mais áxil e eficaz ao ser coñecido de antemán (ou cunha ampla antelación) polo alumnado e o profesorado a través da ferramenta normalizada e institucionalizada das guías docentes DOCNET.

=== ADAPTACIÓN DAS METODOLOXÍAS ===
* Metodoloxías de ensino que se manteñen
As metodoloxías de ensino serán as seguintes para o caso de continxencia, desenvolvido a través da utilización da plataforma e campus de ensino remoto da Universidade de Vigo (Remote Campus ou Integra y Faitic)
- Lección maxistral
- Traballo tutelado (aprendizaxe baseada en proxectos, para traballo colaborativo)
- Prácticas de laboratorio (só no caso da docencia en modalidade mixta. Ver a continuación)

* Metodoloxías de ensino que se modifican
En caso de non poder realizar prácticas de laboratorio presenciais que requiran a manipulación de equipos, poderán ser parcialmente substituídas por "Observación sistemática" realizando experimentos ou informes sobre estruturas ou elementos estruturais, que os estudantes poden realizar dende as súas casas.

* Mecanismo de servizo presencial para estudantes (titorías)
As titorías realizaranse por correo electrónico ao profesor da materia, que poderá resolver as dúbidas por correo electrónico, ou invitar ao alumno a participar nun titorial a través das ferramentas de teledoblación do Campus Remoto ou a aplicación de videoconferencia.

* Modificacións (se procede) do contido que se vai ensinar
Non se contemplan cambios nos contidos da materia

* Bibliografía adicional para facilitar a autoaprendizaxe
Ofreceranse notas detalladas para completar o material de apoio presentado nas clases impartidas a través do Campus Remoto.

* Outras modificacións

=== ADAPTACIÓN DA AVALIACIÓN ===
* Evidencia modificada

(1) Prácticas de laboratorio. Os estudantes que obteñan polo menos 4,5 dos posibles na sección (4) engadiranse o% de puntos indicados nesta sección se asistiron e participaron en todas as prácticas realizadas durante a etapa presencial (ou o formato que a substitúense no seu caso nunha modalidade non presencial) e entregaron neles a documentación solicitada no seu caso. [Novo peso 8%]

(2) Resolución de problemas ou exercicios (boletíns). % da nota adicional no caso de estudantes que cumpran os requisitos do apartado (1) anterior e tamén realizan todos os exercicios de boletín (en formato papel ou cuestionario a través do campus remoto, se procede), tanto durante a etapa. presencial e non presencial. [Novo peso 8%]

(3) Traballo tutelado / Aprendizaxe baseada en proxectos (traballo colaborativo). Aos estudantes que teñan unha nota superior ou igual ao 40% dos puntos posibles no apartado (4), engadirase a nota obtida no traballo (entre 0 e 1 puntos sobre 10): [Novo peso 10%]

(4) Proba final. [Novo peso 66%]

IDENTIFYING DATA				
Estruturas metálicas				
Subject	Estruturas metálicas			
Code	V12G380V01922			
Study programme	Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	4	1c
Teaching language	Castelán			
Department	Enxeñaría dos materiais, mecánica aplicada e construción			
Coordinator	Pereira Conde, Manuel			
Lecturers	Cabaleiro Núñez, Manuel Pereira Conde, Manuel			
E-mail	manuel.pereira@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	Deseñar, calcular e comprobar estruturas metálicas, particularmente de aceiro, coñecendo e aplicando as teorías e sistemas prácticos existentes, así como os métodos e requisitos das NORMAS e REGULAMENTOS vixentes sobre o particular. Preténdese conseguir que o alumno sexa capaz de converter unha estrutura real, nun modelo apto para ser analizado, e viceversa.			

Competencias	
Code	
CG4	CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial na especialidade de Mecánica.
CG5	CG5 Coñecementos para a realización de medicións, cálculos, valoracións, taxacións, peritaxes, estudos, informes, planes de labores e outros traballos análogos.
CG6	CG6 Capacidade para o manexo de especificacións, regulamentos e normas de obrigado cumprimento.
CG11	CG11 Coñecemento, comprensión e capacidade para aplicar a lexislación necesaria no exercicio da profesión de Enxeñeiro Técnico Industrial.
CE23	CE23 Coñecementos e capacidade para o cálculo e deseño de estruturas e construcións industriais.
CT2	CT2 Resolución de problemas.
CT5	CT5 Xestión da información.
CT8	CT8 Toma de decisións.
CT9	CT9 Aplicar coñecementos.
CT10	CT10 Aprendizaxe e traballo autónomos.

Resultados de aprendizaxe			
Learning outcomes	Competences		
Coñecer os fundamentos do comportamento resistente das estruturas metálicas	CG4 CG6 CG11	CE23	CT2 CT5 CT8 CT9
Comprender os criterios nos que se basea a Normativa de Estruturas Metálicas, particularmente de aceiro, manexala e saber aplicala	CG5 CG6 CG11		CT5 CT9 CT10
Conseguir un adecuado dominio práctico do *dimensionamiento e a comprobación dos principais elementos estruturais metálicos	CG4 CG5 CG6 CG11	CE23	CT2 CT5 CT8 CT9 CT10

Contidos	
Topic	
Introdución. Normativa.	Xeneralidades *CTE-SE-A Instrución *EAE *Eurocódigo
Bases de cálculo	Modelado e análise Estados límite últimos Estados límite de servizo
*Durabilidade	*Durabilidade

Materiais	Aceiros en chapas e perfiles Aceiros en parafusos porcas e *arandelas Materiais de achega Resistencia de cálculo
Análise estrutural	Modelos do comportamento lineal Tipos de sección Estabilidade lateral global Imperfeccións iniciais
E.L.U.	Resistencia das seccións Resistencia das barras
E.L.S.	Deformacións, frecha e esborralle Deslizamiento de unións
Unións, bases e apoios	Rixidez Resistencia Resistencia dos medios de unión

Planificación

	Class hours	Hours outside the classroom	Total hours
Estudo previo	0	19	19
Lección maxistral	32.5	30	62.5
Resolución de problemas	18	29	47
Traballo tutelado	0	18.5	18.5
Exame de preguntas de desenvolvemento	3	0	3

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

Metodoloxía docente

	Description
Estudo previo	Actividade autónoma do alumno
Lección maxistral	Lección maxistral
Resolución de problemas	Actividade autónoma do alumno tutelada
Traballo tutelado	Actividade autónoma do alumno tutelada

Atención personalizada

Methodologies	Description
Traballo tutelado	
Estudo previo	

Avaliación

	Description	Qualification	Evaluated Competencess		
Resolución de problemas	Asistencia a clase de problemas e participación activa na resolución dos mesmos	10	CG4 CG5 CG6 CG11	CE23	CT2 CT5 CT8 CT9 CT10
Traballo tutelado	Entrega en tempo e forma de todos os boletíns e/ou traballos	10	CG4 CG5 CG6 CG11	CE23	CT2 CT5 CT8 CT9 CT10
Exame de preguntas de desenvolvemento	Exame escrito de teoría e práctica nas datas establecidas polo centro	80	CG4 CG5 CG6 CG11	CE23	CT2 CT5 CT8 CT9 CT10

Other comments on the Evaluation

O exame puntuarase sobre 8 e consta de *teoria/norma e problema. A *teoria/norma representa un 40% da nota do exame e o problema o 60% restante. Será necesario puntuar polo menos con 3 puntos sobre 10 en cada parte para poder aprobar a materia.

Os boletíns e/ou traballos puntuaranse sobre 1.

As asistencias e participación activa puntuaranse sobre 1 se se asistiu a todas as clases de teoría e prácticas. Permítese unha falta sen xustificar e só admitiranse xustificantes médicos orixinais coa firma&*nbsp;e o número de colexiado do facultativo e&*nbsp;o selo do Centro Médico.

Se se faltou a máis dunha clase sen xustificar puntuarase cun 0.

Será necesario obter no exame unha puntuación mínima de 4 sobre 10 para aprobar a materia.

Non se permitirá a utilización de ningún dispositivo electrónico durante as probas de avaliación salvo autorización expresa. O feito de introducir un dispositivo electrónico non autorizado na aula o día do exame será considerado motivo para a non superación da materia no presente curso académico e a *cualificación global será de suspenso (0,0).

Compromiso ético:

espérase que o alumno presente un comportamento ético adecuado. No caso de detectar un comportamento non ético (copia, plaxio, utilización de aparellos electrónicos non autorizados, e outros) considerarase que o alumno non reúne os requisitos necesarios para superar a materia. Neste caso a cualificación global no presente curso académico será de suspenso (0.0).

Bibliografía. Fontes de información

Basic Bibliography

Varios autores, **Instrucción de Estructuras de acero estructural (EAE)**, Real Decreto 751/2011, http://www.fomento.es/MFOM/LANG_CASTELLANO/ORGANOS,

Complementary Bibliography

Varios autores, **Código Técnico de la Edificación (CTE)**, www.codigotecnico.org,
Varios autores, **Eurocódigos estructurales**,
Argüelles, Argüelles, Arriaga, y Atienza, **Estructuras de acero**,
Argüelles y otros, **Análisis de estructuras**,
Manual de Ensidesa,
Escolá, **Seguridad en los proyectos de ingeniería**,
Zignoli, **Construcciones metálicas**,

Recomendacións

Subjects that continue the syllabus

Ampliación de estruturas e cimentacións/V12G380V01925

Subjects that are recommended to be taken simultaneously

Estruturas de formigón/V12G380V01921

Subjects that it is recommended to have taken before

Resistencia de materiais/V12G380V01402
Elasticidade e ampliación de resistencia de materiais/V12G380V01502
Enxeñaría de materiais/V12G380V01504
Teoría de estruturas e construcións industriais/V12G380V01603

Other comments

Requisitos: Para matricularse nesta materia é necesario superar ou ben estar matriculado de todas as materias dos cursos inferiores ao curso na que está emprazada esta materia.

O exame puntuará sobre 8 puntos e consta de teoría / norma e problema. A teoría / norma representa o 40% da nota do exame e o problema o 60% restante. Para superar o curso será necesario puntuar como mínimo 3 puntos sobre 10 en cada parte. Se non se alcanza este mínimo, a nota máxima de exames será de 3,90 sobre 10.
Durante o curso planificarase a resolución dun traballo / problema práctico polo alumno que puntuará 1.

A asistencia e a participación activa cualificaranse sobre 1 se asistiu a todas as clases de teoría e prácticas. Permítese unha soa ausencia sen xustificar e só se aceptarán documentos xustificativos médicos orixinais coa sinatura, selo e número de colexiados do médico.
Se se perdeu máis dunha clase sen xustificación, puntuarase cun 0.
Será necesario obter unha puntuación mínima de 4 sobre 10 no exame para aprobar o curso. A nota de avaliación continua, é dicir, a do traballo / problema e a das asistencias, validaranse durante 2 cursos académicos. Ambas as notas ou ningunha das dúas serán validadas

En caso de discrepancias prevalecerá a versión en castelán desta guía.

Plan de Continxencias

Description

=== MEDIDAS EXCEPCIONAIS PLANIFICADAS ===
Dada a evolución incerta e imprevisible da alerta sanitaria provocada por COVID-19, a Universidade de Vigo establece unha planificación extraordinaria que se activará no momento en que as administracións e a propia institución o determinen en función de criterios de seguridade, saúde e responsabilidade. e garantir a docencia nun ambiente non presencial ou parcial. Estas medidas xa previstas garanten, no momento requirido, o desenvolvemento do ensino dun xeito máis áxil e eficaz por ser coñecido de antemán (ou con moita antelación) por estudantes e profesores a través da ferramenta normalizada e guías docentes institucionalizadas.

=== ADAPTACIÓN DAS METODOLOXÍAS ===
* Metodoloxías de ensino que se manteñen
Todas as metodoloxías de ensino mantéñense xa que se poden desenvolver mediante o uso da plataforma de teledoblación do Campus Remoto, complementada coa plataforma Faitic:
- Lección maxistral
- Aprendizaxe baseada en proxectos [Resolución de probas ou exercicios]

* Metodoloxías de ensino que se modifican
Non se contemplan cambios na metodoloxía docente

* Mecanismo non presencial de atención para estudantes (titorías)
As titorías realizaranse por correo electrónico ao profesor da materia, quen poderá resolver as dúbidas por correo electrónico, ou invitar ao alumno a participar nun titorial a través das ferramentas de ensino remoto, Campus Remotos, Equipos, etc.).

* Modificacións (se procede) do contido que se vai ensinar
Non se contemplan cambios nos contidos da materia

* Bibliografía adicional para facilitar a autoaprendizaxe
Ofreceranse notas detalladas para completar o material de apoio presentado nas clases impartidas a través do Campus Remoto.

* Outras modificacións

=== ADAPTACIÓN DA AVALIACIÓN ===
* Evidencia modificada
Non se contempla a modificación de probas

* Novas probas
Non se contemplan novas probas

IDENTIFYING DATA				
Electrical installations, surveying and construction				
Subject	Electrical installations, surveying and construction			
Code	V12G380V01923			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	9	Optional	4th	1st
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Arias Sánchez, Pedro Prieto Alonso, Manuel Angel			
Lecturers	Arias Sánchez, Pedro Garrido González, Iván Prieto Alonso, Manuel Angel Saez Blaquez, Cristina			
E-mail	maprieto@uvigo.es parias@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	Legal attributions of Graduated of the technological fields, are to project and direct works for the execution of industrial installations and works in buildings. Based on this, the Graduated must acquire a general knowledge about materials and constructive systems for industrial systems, as well as the legal rules that can affect to this field of work. The main objectives of this subject, highlights: - Knowledges referred the constitution of the electric system in the his group, and rules, constitutive components and techniques in the electric installations, especially of low tension. - Know how the raw and prefabricated materials used in the construction, as well as, its application. - Know how the methodologies and constructive systems existing in the design process of a construction. - Know how and realice the legal rules and normative of general character that affect to the execution of the works supervised for engineers. - Know how the environmental impact of the building and the energetic efficiency solutions.			

Competencies	
Code	
CG1	CG1 Skills for writing, signing and developing projects in the field of industrial engineering, whose purpose, specializing in Mechanics, construction, alteration, repair, maintenance, demolition, manufacturing, installation, assembly or operation of: structures, mechanical equipments, energy facilities, electrical systems and electronic installations and industrial plants, and manufacturing processes and automation.
CG5	CG5 Knowledge to carry out measurements, calculations, assessments, appraisals, surveys, studies, reports, work plans and other similar works.
CG7	CG7 Ability to analyze and assess the social and environmental impact of the technical solutions.
CE23	CE23 Knowledge and ability to calculate and design of structures and industrial buildings.
CE26	CE26 Applied knowledge of systems and manufacturing processes, metrology and quality control.
CT2	CT2 Problems resolution.
CT7	CT7 Ability to organize and plan.
CT8	CT8 Decision making.
CT9	CT9 Apply knowledge.
CT10	CT10 Self learning and work.
CT12	CT12 Research skills.
CT17	CT17 Working as a team.
CT20	CT20 Ability to communicate with people not expert in the field.

Learning outcomes	
Learning outcomes	Competences

Capacity stop the development and direction of projects within the scope of the industrial engineering, that have by object to building, reform, repair, preservation, *demolición, or *montaxe of structures, energetic and electric installations. Knowledge applied of systems and processes of *metroloxía and control of the quality. Purchase knowledges of *topografía and be the one who to apply them the works. Purchase knowledges of the constructive elements. Knowledge and utilization of the principles of theory of circuits and electric machines.	CG1 CG5 CG7	CE23 CE26	CT2 CT7 CT8 CT9 CT10 CT12 CT17 CT20
New	CG1 CG5 CG7	CE23 CE26	CT2 CT7 CT8 CT9 CT10 CT12 CT17 CT20

Contents	
Topic	
Bases of the Geotechnologies	Sources for Cartographic data. Web resources. Geomatic methodologies how raw data: Surveying, Photogrametry, LiDAR, GNSS. Instrumentation. Generation of Point Clouds. Surfaces and level curves. Industrial surveying, accuracy. Reverse engineering.
Applications of Surveying	Activities related with the execution of a work. Survey stakeout. Definition and procedure. Instrumentation. Survey stakeout of points and alignements. Planimetric & altimetric methods for survey stakeout. Linear surveying, general considerations. Linear profiles, methods. Trasversal profiles and transversal sections. Slides. Volumetric measurements. Earth-moving.
Urbanism and land planning	The project. The process of bidding. The construction companies. Planning and management of a work. Execution and control of Works, agents. Activities related with the execution of a work. The administrative structure by means of Geographical Information Systems.
Construcción materials and machinery	Introduction of building materials. Materials: Stone, Ceramic, Binder, Organic, Metallic. Mortar & concrete. Prefabricated materials. Auxiliary structures.
Systems and Constructive Processes	Environmental management. Retain walls. Earth-moving. Drainages and foundations. Beams and pillars. Closings. Installations. The building and safe energy, constructive solutions.
Electrical power system	The national electrical power system Components of an electrical power system Operation of the power system. Electricity market
Components of electrical installations	Electrical conductors and cables Switching, control and protection devices Transformers Motors Lighting equipment Energy meters. Power factor correction
Electrical installation design methodology	Installed power loads Máximum power demand Cable selection based on ampacity, on voltage drop and short circuit temperature rise
Regulations and standards for electrical installations	National standards for electrical installations: REBT, MIE-RAT, LAT, CTE
Electrical drawings	Electrical symbols Power drawings One-line electrical diagrams Control drawings
Lighting	Fundamentals of lighting Photometric magnitudes Lighting calculations methods

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	44	78	122
Problem solving	4	8	12
Laboratory practical	14	20	34
Practices through ICT	10	12	22
Studies excursion	4	2	6
Objective questions exam	1	0	1
Problem and/or exercise solving	2	0	2
Report of practices, practicum and external practices	2	24	26

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

Methodologies

	Description
Lecturing	Exhibition by part of the professor of the contents on the matter object of study, theoretical bases and/or guidelines of a work, exercise or project to develop by the student.
Problem solving	Activity in which they formulate problem and/or exercises related with the matter. The student has to develop the ideal or correct solutions by means of the exercise of routines, the application of formulas or algorithms, the application of procedures of transformation of the available information and the interpretation of the results. It is used to employ as I complement of the lesson *magistral.
Laboratory practical	Activities of application of the knowledges to concrete situations and of acquisition of basic skills and of procedure related with the matter object of study. They develop in special spaces with *equipación skilled.
Practices through ICT	Activities of application of the knowledges to concrete situations, and of acquisition of basic skills and of procedure related with the matter object of study. They develop through the TIC in the classrooms of computing.
Studies excursion	Activities of application of the knowledges to concrete situations and of acquisition of basic skills and of procedure related with the matter object of study. They develop in spaces no external academicians.

Personalized assistance

Methodologies	Description
Laboratory practical	Practices of laboratory
Practices through ICT	Practices in classrooms of computing

Assessment

	Description	Qualification	Evaluated Competencess		
Objective questions exam	Global evaluation of the educational process and the acquisition of competitions and knowledges through proofs type test.	20	CG5	CE23 CE26	CT8 CT9
Problem and/or exercise solving	Global evaluation of the educational process and the acquisition of competitions and knowledges through proofs of resolution of problems and exercises.	40	CG7	CE26	CT2 CT7 CT9
Report of practices, practicum and external practices	Global evaluation of the educational process and the acquisition of competitions and knowledges through memory of works realized in the computer room or field practice.	40	CG1 CG5 CG7	CE23 CE26	CT7 CT10 CT12 CT17 CT20

Other comments on the Evaluation

The note of the subject will be the average resultant of the score achieved in the tests of objective questions, in the case of study and in the report of practices. A minimum score will be mandatory (it will indicate during the teaching period). The option of July keeps the score achieved in the report or memory of practices realized during the period of continuous evaluation. The calculation of the final score will follow the same methodological parameters that the realized in May, in relation with minimum score to achieve.
Tests Schedule, consult of form updated in the page web of the centre

Sources of information

Basic Bibliography

Moreno Garzón, Ignacio, **Topografía aplicada a la construcción y replanteo de obras**, Granada : C.O.A.A.T., D.L., 1995
Martínez Fernández, Francisco Manue, **Topografía práctica para la construcción**, Barcelona: Ceac, 2007

Schmitt, Heinrich, **Tratado de construcción**, 8ª ed. amp., 2009
Neila González, F. Javier, **Arquitectura bioclimática y construcción sostenible**, 2009
Crespo Escobar, Santiago, **Materiales de construcción para edificación y obra civil**, Editorial Club Universitario, 2010, 2010
Ministerio de Industria y Energía, RD 842/2002, **Reglamento Electrotécnico para BT, 2002**, 2002
Moreno Alfonso, Narciso; Cano González, Ramón, **Instalaciones eléctricas en baja tensión**, Paraninfo, 2017
García Trasancos, José, **Instalaciones eléctricas en media y baja tensión**, Paraninfo, 2009

Complementary Bibliography

Garrard, Chris, **Geoprocesing with Python**, Shelter Island, NY: Manning, cop, 2016
Paul Bolstad, **GIS fundamentals : a first text on geographic information systems**, 4ª, White Bear Lake (Minnesota): Eider press, 2012

Recommendations

Subjects that continue the syllabus

Final Year Dissertation/V12G380V01991

Subjects that it is recommended to have taken before

Graphic expression: Graphic expression/V12G380V01101
Computer science: Computing for engineering/V12G380V01203
Technical Office/V12G380V01701

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 ===
* Teaching methodologies maintained

* Teaching methodologies modified

* Non-attendance mechanisms for student attention (tutoring)

* Modifications (if applicable) of the contents

* Additional bibliography to facilitate self-learning

* Other modifications

=== ADAPTATION OF THE TESTS ===
* Tests already carried out
Test XX: [Previous Weight 00%] [Proposed Weight 00%]
...

* Pending tests that are maintained
Test XX: [Previous Weight 00%] [Proposed Weight 00%]
...

* Tests that are modified
[Previous test] => [New test]

* New tests

* Additional Information

IDENTIFYING DATA				
Instalacións térmicas e de fluídos				
Subject	Instalacións térmicas e de fluídos			
Code	V12G380V01924			
Study programme	Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	9	Optional	4	1c
Teaching language				
Department	Enxeñaría mecánica, máquinas e motores térmicos e fluídos			
Coordinator	Molares Rodríguez, Alejandro Pequeño Aboy, Horacio			
Lecturers	Molares Rodríguez, Alejandro Pequeño Aboy, Horacio			
E-mail	horacio@uvigo.es a.molares@uvigo.es			
Web				
General description	Nesta guía docente preséntase información relativa á materia Instalacións Térmicas e de Fluídos de 4º curso do grao en Enxeñaría Mecánica para o curso 2013-2014, no que se continúa de forma coordinada un achegamento ás directrices marcadas polo Espazo Europeo de Educación Superior. Neste documento recóllense as competencias xenéricas que se pretende que os alumnos adquiran neste curso, o calendario de actividades docentes previsto e a guía docente de materia. A materia pretende resolver, *dimensionar e analizar problemas de instalacións e aplicacións industriais en diferentes ámbitos da Enxeñaría. Algunha destas aplicacións industriais son: - Confort e climatización - Cálculo de cargas térmicas - Sistemas de calefacción e ventilación, calor e frío. - Cálculo de sistemas de enerxía solar térmica - Deseño de sistemas de tubaxes - Instalacións de fontanaría, aire comprimido - Instalacións de saneamento, antiincendios			

Competencias	
Code	
CG4	CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial na especialidade de Mecánica.
CG5	CG5 Coñecementos para a realización de medicións, cálculos, valoracións, taxacións, peritaxes, estudos, informes, planes de labores e outros traballos análogos.
CG6	CG6 Capacidade para o manexo de especificacións, regulamentos e normas de obrigado cumprimento.
CG7	CG7 Capacidade para analizar e valorar o impacto social e ambiental das solucións técnicas.
CG11	CG11 Coñecemento, comprensión e capacidade para aplicar a lexislación necesaria no exercicio da profesión de Enxeñeiro Técnico Industrial.
CE7	CE7 Coñecementos de termodinámica aplicada e transmisión de calor. Principios básicos e a súa aplicación á resolución de problemas de enxeñaría.
CE21	CE21 Coñecementos aplicados de enxeñaría térmica.
CT2	CT2 Resolución de problemas.
CT9	CT9 Aplicar coñecementos.
CT10	CT10 Aprendizaxe e traballo autónomos.
CT15	CT15 Obxectivación, identificación e organización.
CT17	CT17 Traballo en equipo.

Resultados de aprendizaxe			
Learning outcomes	Competences		
Capacidade para calcular e deseñar instalacións térmicas.	CG4 CG5 CG6 CG7 CG11	CE7 CE21	CT2 CT9 CT10 CT15 CT17

Comprender os aspectos básicos das máquinas térmicas	CG4 CG5 CG6 CG7 CG11	CE7 CE21	CT2 CT9 CT10 CT17
Comprender os aspectos básicos dos equipos de climatización	CG4 CG5 CG6 CG7 CG11	CE7 CE21	CT2 CT9 CT10 CT17
Comprender os aspectos básicos das enerxías renovables	CG4 CG5 CG6 CG7 CG11	CE7 CE21	CT2 CT9 CT10 CT17

Contidos	
Topic	
PARTE *I:	INSTALACIÓNS TÉRMICAS
Tema 1: Introdución	Instalacións térmicas en edificios Notas históricas sobre o acondicionamento de aire Uso de enerxía en edificios
Tema 2: *Psicometría: procesos elementais.	Propiedades do aire húmido *Diagrama *psicrométrico Quecemento e arrefriado sensibles *Humectación Mestura *adiabática Arrefriado e *deshumectación
Tema 3: Transferencia de calor e condicións de deseño.	Sala de caldeiras Esquemas Normativa Fundamentos de transferencia de calor Illamento térmico Requirimentos de ventilación Condiciones exteriores de deseño Calculo de cargas
Tema 4: Instalacións de Calefacción e ACS	Sala de caldeiras Compoñentes dunha instalación de calor e ACS Esquemas hidráulicos *Dimensionamiento e cálculo *Normatica
Tema 5: Instalacións de climatización	Sala de caldeiras Compoñentes dunha instalación de calor e ACS Esquemas hidráulicos *Dimensionamiento e cálculo Normativa
Tema 6: Cálculo de Instalacións Solares Térmicas	Compoñentes da instalación solar Esquemas hidráulicos *Dimensionamiento e normativa
PARTE *II:	INSTALACIÓNS DE FLUÍDOS
Tema 7: Definicións e Conceptos Preliminares	Aplicacións Concepto de Fluído. Principios básicos: Viscosidade, Presión. Presión de saturación. *Cavitación
Tema 8: Ecuacións fundamentais dun Fluxo	Ecuación de Continuidade. Ecuación da Enerxía. *Bernoulli con perdas
Tema 9: Resistencia de superficie. Perdas en tubaxes.	Coeficiente de fricción Ecuación de *Darcy-*Weisbach. *Diagrama de *Moody O tres problemas fundamentais en tubaxes Perdas singulares
Tema 10: *Dimensionado de condutos e distribución de aire en locais	Bases do fluxo de aire en condutos Perda de carga en condutos (fricción e perdas dinámicas) Principios e consideracións do deseño de condutos de aire *Dimensionado de condutos (métodos de igual fricción, velocidade constante e recuperación estática) Principios da distribución de aire en locais

Tema 11: Instalacións Forzadas	Clasificación e descrición de Bombas Curvas características, Asociación de Bombas Asociación de Tubaxes Método de resolución sistemas de mallas. *Hardy-Cros
Tema 12: Instalacións de Fontanaría	Tipos de Instalación *AF/ACS Normativa de Instalacións de fontanaría Cálculos específicos
Tema 13: Instalacións de aire comprimido	Compoñentes básicos das instalacións Tipos de instalacións Normativa vixente Cálculos específicos
Tema 14: Outras Instalacións	Instalación de saneamento Instalación antiincendios Instalación reutilización de pluviais Instalación de gas

Planificación

	Class hours	Hours outside the classroom	Total hours
Resolución de problemas	12	0	12
Prácticas de laboratorio	12	0	12
Lección maxistral	52	127	179
Exame de preguntas de desenvolvemento	2	0	2
Traballo	0	20	20

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

Metodoloxía docente

	Description
Resolución de problemas	Aplicaranse os conceptos desenvolvidos de cada tema á solución de exercicios. Inclúe actividades tales como: Lecturas Seminarios Solución de problemas Aprendizaxe *colaborativo Estudo de casos prácticos
Prácticas de laboratorio	Aplicaranse os conceptos desenvolvidos de cada tema á realización de prácticas de laboratorio. Fundamentalmente, realizaranse actividades de experimentación, aínda que tamén poderán realizarse: Casos prácticos Simulación Solución de problemas Aprendizaxe *colaborativo
Lección maxistral	Explícanse os fundamentos de cada tema para posterior resolución de problemas prácticos. Poderanse realizar actividades como: Sesión maxistral Lecturas Revisión bibliográfica Resumen Esquemas Solución de problemas Conferencias Presentación oral

Atención personalizada

Methodologies	Description
Lección maxistral	clases de teoría
Resolución de problemas	clases e propuestos para a casa
Prácticas de laboratorio	Presenciales

Avaliación

Description	Qualification	Evaluated Competencess

Resolución de problemas	Resolución de problemas e/ou exercicios propostos, incluíndo: -entregas semanais (non presencial) -resolución presencial en horario de prácticas	70	CG4 CG5 CG6 CG7 CG11	CE7 CE21	CT2 CT9 CT15
Traballo	Exposición de proxectos e traballos.	30	CG5	CE21	CT10 CT17

Other comments on the Evaluation

É imprescindible para aprobar a materia obter unha cualificación de 5 no computo global, e un mínimo de 4 no total de cada unha das dúas partes: Térmicas e Fluídos. A proba escrita (70%) realizarase en dous partes independentes, o mesmo día e de forma consecutiva.

Compromiso ético: espérase que o alumno presente un comportamento ético adecuado. No caso de detectar un comportamento non ético (copia, plaxio, utilización de aparellos electrónicos non autorizados, e outros) considerarase que o alumno non reúne os requisitos necesarios para superar a materia. Neste caso a cualificación global no presente curso académico será de suspenso (0.0).

Bibliografía. Fontes de información

Basic Bibliography

Carrier, **Manual de aire acondicionado**,
Jose Mª Igoa, **Manual del constructor**,
J.A. Andres y Rodríguez Pomatta, **Calefacción y Agua caliente sanitaria**,
Angel Miranda, **Aire acondicionado**,
Bengoa Porras, **Apuntes sobre instalaciones en la edificación**,

Complementary Bibliography

Recomendacións

Subjects that it is recommended to have taken before

Mecánica de fluídos/V12G380V01405
Termodinámica e transmisión de calor/V12G380V01302

Other comments

Recoméndase ao alumno:
*Seguimento continuo da materia
Asistencia a clase
Dedicación das horas de traballo persoal á materia

Requisitos: Para matricularse nesta materia é necesario superar ou ben estar matriculado de todas as materias dos cursos inferiores ao curso no que está situada esta materia.

En caso de discrepancias prevalecerá a versión en castelán de está guía.

Plan de Continxencias

Description

=== MEDIDAS EXCEPCIONAIS PLANIFICADAS ===
Ante a incerta e imprevisible evolución da alerta sanitaria provocada polo *COVID-19, a Universidade de Vigo establece unha planificación extraordinaria que se activará no momento en que as administracións e a propia institución determíneno atendendo a criterios de seguridade, saúde e responsabilidade, e garantindo a docencia nun escenario non presencial ou parcialmente presencial. Estas medidas xa planificadas garanten, no momento que sexa preceptivo, o desenvolvemento da docencia dun modo máis áxil e eficaz ao ser coñecido de antemán (ou cunha ampla antelación) polo alumnado e o profesorado a través da ferramenta normalizada e institucionalizada das guías docentes.

=== ADAPTACIÓN DAS METODOLOXÍAS ===
* Metodoloxías docentes que se manteñen

Resolución de problemas
Aplicaranse os conceptos desenvolvidos de cada tema á solución de exercicios. Inclúe

actividades tales como:
Lecturas
Seminarios
Solución de problemas
Aprendizaxe *colaborativo
Estudo de casos prácticos

Prácticas de laboratorio
Aplicaranse os conceptos desenvolvidos de cada tema á realización de prácticas de laboratorio.
Fundamentalmente, realizaranse actividades de experimentación, aínda que tamén poderán realizarse:
Casos prácticos
Simulación
Solución de problemas
Aprendizaxe *colaborativo

Lección maxistral
Explícanse os fundamentos de cada tema para posterior resolución de problemas prácticos. Poderanse realizar actividades como:
Sesión maxistral
Lecturas
Revisión bibliográfica
Resumen
Esquemas
Solución de problemas
Conferencias
Presentación oral

* Metodoloxías docentes que se modifican

En caso de causa de forza maior que imposibilite a docencia de tipo presencial en cada un dos apartados indicados na metodoloxía docente (Resolución de Problemas, Prácticas de Laboratorio, Sesión Maxistral), impartirase a docencia de contidos teóricos por medios *telemáticos postos a disposición do profesorado, si existisen contidos non *virtualizables como é o caso das prácticas de laboratorio, poderanse substituír por outro tipo de contidos que a xuízo do profesorado da materia permitan conseguir as competencias asociadas ás mesmas.

* Mecanismo non presencial de atención ao alumnado (*tutorías)

En caso de causa de forza maior que imposibilite a docencia de tipo presencial, o profesorado adaptará os horarios de *tutorías previstos realizando estas de maneira *telemática.

* Modificacións (si proceden) dos contidos a impartir

Non se modifica

* Bibliografía adicional para facilitar o auto-aprendizaxe

Non se modifica

* Outras modificacións

Non se modifica

=== ADAPTACIÓN DA AVALIACIÓN ===
* Probas xa realizadas
Proba *XX: [Peso anterior 00%] [Peso Proposto 00%]
...

Mantéñense os pesos das probas de avaliación realizadas

* Probas pendentes que se manteñen
Proba *XX: [Peso anterior 00%] [Peso Proposto 00%]

Mantéñense os pesos das probas de avaliación pendentes
...

* Probas que se modifican
[Proba anterior] => [Proba nova]

Mantéñense os pesos das probas de avaliación que se modifican

* Novas probas

Mantéñense os pesos nas probas de avaliación da materia

* Información adicional

Mantéñense os criterios de avaliación adecuando a realización das probas, en caso de ser necesario e por indicación en Resolución Reitoral, aos medios telemáticos postos a disposición do profesorado.

IDENTIFYING DATA

Ampliación de estruturas e cimentacións

Subject	Ampliación de estruturas e cimentacións			
Code	V12G380V01925			
Study programme	Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	4	2c
Teaching language	Castelán			
Department	Enxeñaría dos materiais, mecánica aplicada e construción			
Coordinator	Caamaño Martínez, José Carlos			
Lecturers	Caamaño Martínez, José Carlos Pereira Conde, Manuel			
E-mail	jccaam@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	Coñecer e dominar os criterios de diseño e dimensionamento das cimentacions e outros elementos estruturales, comprendendo e sabendo aplicar os criterios da normativa.			

Competencias

Code	
CG4	CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial na especialidade de Mecánica.
CG5	CG5 Coñecementos para a realización de medicións, cálculos, valoracións, taxacións, peritaxes, estudos, informes, planes de labores e outros traballos análogos.
CG6	CG6 Capacidade para o manexo de especificacións, regulamentos e normas de obrigado cumprimento.
CG11	CG11 Coñecemento, comprensión e capacidade para aplicar a lexislación necesaria no exercicio da profesión de Enxeñeiro Técnico Industrial.
CE23	CE23 Coñecementos e capacidade para o cálculo e deseño de estruturas e construcións industriais.
CT2	CT2 Resolución de problemas.
CT5	CT5 Xestión da información.
CT8	CT8 Toma de decisións.
CT9	CT9 Aplicar coñecementos.
CT10	CT10 Aprendizaxe e traballo autónomos.

Resultados de aprendizaxe

Learning outcomes	Competences		
Coñecementos e capacidades para aplicar os fundamentos do cálculo das estruturas de formigón e metálicas ao proxecto, reparación e reforzo de estruturas. Deseño e calculo de pontes grua. Comprender os criterios, manexar e saber aplicar a normativa sobre cálculo e deseño de cimentacións e bases de apoio.	CG4 CG5 CG6 CG11	CE23	CT2 CT5 CT8 CT9 CT10
Coñecer as técnicas básicas da xeotecnia e os principios da mecánica de solos aplicados ó cálculo de elementos estruturais de cimentación. Dispor de nocións elementais de cálculo sobre reforzo de estruturas, e estruturas doutros materiais.	CG5 CG6 CG11	CE23	CT5 CT10

Contidos

Topic	
Estados Límite de Servizo	Dimensionamento e comprobación de elementos estruturais en Estados Límite de Servizo
Deseño e cálculo de elementos estruturais	Deseño e cálculo de elementos estruturais. Pontes grua.
Deseño e cálculo de elementos de cimentación	Nocións de xeotecnica e mecánica de solos Tipos de cimentacións Deseño e cálculo de cimentacións. Tipoloxías. Bases e apoios sobre elementos de cimentación
Reforzo de estruturas existentes	Tipos de reforzo Dimensionamento de reforzos mediante fibra de carbono

Planificación

	Class hours	Hours outside the classroom	Total hours

Prácticas de laboratorio	18	29	47
Resolución de problemas	0	18.5	18.5
Resolución de problemas de forma autónoma	0	19	19
Lección maxistral	32.5	30	62.5
Exame de preguntas de desenvolvemento	3	0	3
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente

	Description
Prácticas de laboratorio	Actividade do alumno autónoma e *tutorizada
Resolución de problemas	
Resolución de problemas de forma autónoma	
Lección maxistral	Lección maxistral

Atención personalizada

Methodologies	Description
Resolución de problemas de forma autónoma	

Avaliación

	Description	Qualification	Evaluated Competencess		
Prácticas de laboratorio	Asistencia, participación activa e entrega en tempo e forma de toda a documentación solicitada. Requierese unha nota alomenos de 4'5 puntos no exame.	5	CG4 CG5 CG6 CG11	CE23	CT2 CT5 CT8 CT9 CT10
Resolución de problemas	Adicionalmente, os alumnos que reúnan TODOS E CADA UN dos requisitos para a puntuación das 'Prácticas de laboratorio', E QUE ADEMÁIS ENTREGUEN NO SEU CASO TODOS OS PROBLEMAS PROPOSTOS PARA RESOLVER NA CASA, SUMARÍASELLES 0'5 PUNTOS Á NOTA	5	CG4 CG5 CG6 CG11	CE23	CT2 CT5 CT8 CT9 CT10
Resolución de problemas de forma autónoma	Durante o curso poderáse propor a elaboración de traballos relacionados coa asignatura. Neste caso, requeriráse obter unha nota en examen maior ou igual ó 40% da calificación máxima posible no mesmo, para sumar a nota obtida no traballo. Os traballos puntuaránse en función da sua calidade sobre unha nota máxima de 1 punto sobre 10.	10	CG4 CG5 CG6 CG11	CE23	CT2 CT5 CT8 CT9 CT10
Exame de preguntas de desenvolvemento	Exame escrito de teoría e práctica nas datas establecidas polo centro Ponderación mínima sobre a nota final:	80	CG4 CG5 CG6 CG11	CE23	CT2 CT5 CT8 CT9 CT10

Other comments on the Evaluation

Compromiso ético: Se espera que el alumno presente un comportamiento ético adecuado. En el caso de detectar un comportamiento no ético (copia, plagio, utilización de aparatos electrónicos no autorizados, y otros) se considerará que el alumno no reúne los requisitos necesarios para superar la materia. En este caso la calificación global en el presente curso académico será de suspenso (0.0).

No se permitirá la utilización de ningún dispositivo electrónico durante las pruebas de evaluación salvo autorización expresa. El hecho de introducir un dispositivo electrónico no autorizado en el aula de examen será considerado motivo de no superación de la materia en el presente curso académico y la calificación global será de suspenso (0.0).

Bibliografía. Fontes de información

Basic Bibliography

Varios autores, **Instrucción de Hormigón Estructural EHE-08**, 2008, Ministerio de Fomento,

Varios autores, **Guía de aplicación de la Instrucción de Hormigón Estructural. EDIFICACIÓN**, 2012, Ministerio de Fomento,

Complementary Bibliography

Morán Cabré, F.; García Meseguer, A.; Arroyo Portero, J.C., **Jiménez Montoya. Hormigón armado**, 14ª, Gustavo Gili,
Calavera Ruiz, **Cálculo de estructuras de cimentación**, 4ª, Intemac, 2009
Calavera Ruiz, **Cálculo de flechas en estructuras de hormigón armado**, Intemac, 2009
Calavera Ruiz, **Proyecto y cálculo de estructuras de hormigón**, Intemac, 2008
Varios, miembros de la Comisión Permanente del Hormigón, **La EHE explicada por sus autores**, Leynfor siglo XXI, 2000
Villodre Roldán, **Ejercicios prácticos de hormigón armado**, Universidad de Alicante, 2000

Recomendacións

Other comments

En caso de discrepancia prevalecerá a versión en castelán de esta guía

Plan de Continxencias

Description

=== MEDIDAS EXCEPCIONAIS PLANIFICADAS ===
Ante a incerta e imprevisible evolución da alerta sanitaria provocada pola COVID- 19, a Universidade establece una planificación extraordinaria que se activará no momento en que as administracións e a propia institución o determinen atendendo a criterios de seguridade, saúde e responsabilidade, e garantindo a docencia nun escenario non presencial ou non totalmente presencial. Estas medidas xa planificadas garanten, no momento que sexa preceptivo, o desenvolvemento da docencia dun xeito mais áxil e eficaz ao ser coñecido de antemán (ou cunha ampla antelación) polo alumnado e o profesorado a través da ferramenta normalizada e institucionalizada das guías docentes DOCNET.

=== ADAPTACIÓN DAS METODOLOXÍAS ===

* Metodoloxías de ensino que se manteñen

As metodoloxías de ensino serán as seguintes para o caso de continxencia, desenvolvido a través da utilización da plataforma e campus de ensino remoto da Universidade de Vigo (Remote Campus ou Integra y Faitic)
- Lección maxistral
- Traballo tutelado (aprendizaxe baseada en proxectos, para traballo colaborativo)
- Prácticas de laboratorio (só no caso da docencia en modalidade mixta. Ver a continuación)

* Metodoloxías de ensino que se modifican

En caso de non poder realizar prácticas de laboratorio presenciais que requiran a manipulación de equipos, poderán ser parcialmente substituídas por "Observación sistemática" realizando experimentos ou informes sobre estruturas ou elementos estruturais, que os estudantes poden realizar dende as súas casas.

* Mecanismo de servizo presencial para estudantes (titorías)

As titorías realizaranse por correo electrónico ao profesor da materia, que poderá resolver as dúbidas por correo electrónico, ou invitar ao alumno a participar nun titorial a través das ferramentas de teledoblación do Campus Remoto ou a aplicación de videoconferencia.

* Modificacións (se procede) do contido que se vai ensinar

Non se contemplan cambios nos contidos da materia

* Bibliografía adicional para facilitar a autoaprendizaxe

Ofreceranse notas detalladas para completar o material de apoio presentado nas clases impartidas a través do Campus Remoto.

* Outras modificacións

=== ADAPTACIÓN DA AVALIACIÓN ===

* Evidencia modificada

(1) Prácticas de laboratorio. Os estudantes que obteñan polo menos 4,5 dos posibles na sección (4) engadiranse o% de puntos indicados nesta sección se asistiron e participaron en todas as prácticas realizadas durante a etapa presencial (ou o formato que a substitúense no seu caso nunha modalidade non presencial) e entregaron neles a documentación solicitada no seu caso. [Novo peso 8%]

(2) Resolución de problemas ou exercicios (boletíns). % da nota adicional no caso de estudantes que cumpran os requisitos do apartado (1) anterior e tamén realizan todos os exercicios de boletín (en formato papel ou cuestionario a través do campus remoto, se procede), tanto durante a etapa. presencial e non presencial.
[Novo peso 8%]

(3) Traballo tutelado / Aprendizaxe baseada en proxectos (traballo colaborativo). Aos estudantes que teñan unha nota superior ou igual ao 40% dos puntos posibles no apartado (4), engadirase a nota obtida no traballo (entre 0 e 1 puntos sobre 10): [Novo peso 10%]

(4) Proba final. [Novo peso 66%]
Enviar comentarios
Historial
Guardadas

IDENTIFYING DATA				
Deseño e comunicación de produto e automatización de elementos en planta				
Subject	Deseño e comunicación de produto e automatización de elementos en planta			
Code	V12G380V01931			
Study programme	Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	9	Optional	4	1c
Teaching language				
Department	Deseño na enxeñaría Enxeñaría de sistemas e automática			
Coordinator	Bouza Rodríguez, José Benito Fernández Silva, Celso			
Lecturers	Bouza Rodríguez, José Benito Comesaña Campos, Alberto Fernández Silva, Celso			
E-mail	jbouza@uvigo.es csilva@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	A materia está composta por dous bloques temáticos, un relacionado co deseño e comunicación de producto e outro coa automatización de elementos en planta, cadanseu impartido por áreas diferentes. OBXECTIVOS DO PRIMEIRO BLOQUE: Coñecer a metodoloxía para o deseño de productos industriais e os diversos factores e aspectos que interveñen no control do ciclo de vida do produto. Inserir ó estudante na cultura do deseño, abrindo a mente ás novas posibilidades, fomentando a innovación e a competitividade. Coñecer as tendencias actuáis e as bases tecnolóxicas sobre as que se sustentan e efectuar o seguimento das investigación mais recentes sobre do deseño, a innovación e a tecnoloxías en xeral. Ser capaz de extraer conclusións a partires da experiencia, na percura de solución a problemas reais. Coñecer e saber seleccionar as técnicas creativas axeitadas para cada caso concreto. OBXECTIVOS DO SEGUNDO BLOQUE: Habilidade para concibir e desenvolver sistemas automáticos. Capacidade de seleccionar e configurar un autómata programable industrial para unha aplicación específica de automatización, así como determinar o tipo e características dos sensores e actuadores necesarios. Obter a capacidade de analizar as necesidades dun proxecto de automatización e fixar as súas especificacións eliminando ambigüedades e incongruencias. Destreza para concibir, valorar, planificar, desenvolver e implantar proxectos automáticos utilizando os principios e metodoloxías propias da enxeñaría. Capacidade de traducir un modelo de funcionamento a un programa de autómata. Detectar e diagnosticar erros e averías en procesos de automatización industrial. Ser capaz de integrar distintas tecnoloxías (electrónicas, eléctricas, neumáticas, etc) nunha única automatización.			

Competencias	
Code	
CG3	CG3 Coñecemento en materias básicas e tecnolóxicas que os capacite para a aprendizaxe de novos métodos e teorías, e os dote de versatilidade para adaptarse a novas situacións.
CE12	CE12 Coñecementos sobre os fundamentos de automatismos e métodos de control.
CT3	CT3 Comunicación oral e escrita de coñecementos.
CT6	CT6 Aplicación da informática no ámbito de estudo.
CT8	CT8 Toma de decisións.
CT9	CT9 Aplicar coñecementos.
CT14	CT14 Creatividade.
CT16	CT16 Razoamento crítico.
CT17	CT17 Traballo en equipo.
CT20	CT20 Capacidade para comunicarse con persoas non expertas na materia.

Resultados de aprendizaxe	
Learning outcomes	Competences

Coñecemento da metodoloxía para o deseño de produto e dos factores e aspectos que interveñen no control do seu ciclo de vida.	CG3		CT8 CT14 CT17
Mergullarse na cultura do deseño, abrindo a mente a novas posibilidades, fomentando a innovación e a competitividade.			CT3 CT8 CT14 CT16 CT17
Comprensión e manexo de diversos aspectos do deseño de produtos como: modelo, función, forma, estética, ergonomía, calidade, facilidade de fabricación, contorna ambiental, etc.	CG3		CT8 CT9 CT14
Comprensión dos fundamentos a ter en conta para conseguir un deseño ergonómico para o usuario.	CG3		CT9 CT16
Coñecemento das técnicas a seguir para comunicar e facer chegar con eficacia un novo deseño aos usuarios.	CG3		CT3 CT6 CT17
Habilidade para concibir e desenvolver sistemas automáticos.		CE12	CT8 CT14
Capacidade de seleccionar e configurar un autómata programable industrial para unha aplicación específica de automatización así como determinar o tipo e características dos sensores e actuadores necesarios		CE12	CT8 CT9 CT16
Destreza para concibir, valorar, planificar, desenvolver e implantar proxectos automáticos utilizando os principios e metodoloxías propias da enxeñaría.		CE12	CT6 CT20
Capacidade de traducir un modelo de funcionamento a un programa de autómata		CE12	CT6

Contidos	
Topic	
1ª PARTE - DESEÑO E COMUNICACIÓN DE PRODUTO	-
1. O DESEÑO	1.1 Concepto. Tipos de deseño. Deseño de produto. 1.2 Evolución histórica. Tendencias actuais. 1.3 O deseño en España. Sectores. O caso galego. 1.4 Teorías sobre o deseño. Análise comparativa.
2. TÉCNICAS PARA O DESEÑO POR FACTORES (DfX)	2.1 Deseño para a manufactura e a ensamblaxe (DfMA) 2.1.1 Características. 2.1.2 Metodoloxía. 2.1.3 Guías. 2.2 Deseño para o medio ambiente (DfE). Ecodeseño. 2.3 Deseño para a calidade (DfQ). 2.4 Outras.
3. ENXEÑARÍA INVERSA	3.1 Concepto 3.2 Técnicas e Métodos para a obtención de datos. 3.3 Ferramentas para a manipulación de datos. 3.4 Aplicacións.
4. FUNDAMENTOS BIOMECÁNICOS DO DESEÑO ERGONÓMICO	4.1 Introdución á Enxeñería Biomecánica. 4.2 Biomecánica do óso e da columna lumbar. 4.3 Ergonomía. 4.4 Factores biomecánicos que inflúen no deseño. 4.5 Factores ergonómicos a ter en conta no deseño.
5. DESEÑO ERGONÓMICO DE PRODUCTOS E PROCESOS	5.1 Ergonomía de producto. 5.2 Ergonomía do posto de traballo. 5.3 Deseño para a prevención de lesións ergonómicas no posto de traballo. 5.4 Deseño para a prevención de lesións no manexo de cargas.
6. A ESTÉTICA NO DESEÑO	6.1 Fundamentos da estética 6.2 Factores que inflúen na estética 6.2.1 O color no deseño 6.2.2 A forma e a proporción 6.2.2.1 A proporción áurea 6.3 Aspectos no deseño para que sexa máis estético

7. PRESENTACIÓN, COMUNICACIÓN E PROMOCIÓN DO PRODUTO	7.1 Presentación do produto. Etiquetaxe e envase. 7.2 A distribución. O packaging. 7.3 A Comunicación na empresa. Identidade Corporativa. 7.4 Tecnoloxías para a comunicación e promoción do produto. Interfaces gráficas. 7.5 As Tics.
8. PROTECCIÓN DOS DESEÑOS	8.1 Patentes. Modelos de utilidade. Marcas. 8.2 Patente nacional, europea e internacional. 8.3 Procedemento para a obtención de patentes. Pasos, requisitos, taxas. 8.4 A OEPM. O BOPI.
PRÁCTICAS 1ª PARTE Deseño / redeseño dun produto, a realizar durante as sesións de prácticas. Proceso de xeración do mesmo, creación de modelos e prototipos, ensaios, deseño da comunicación e documentación do mesmo.	1. Definición de obxectivos e elección do traballo a realizar (1h). 2. Sesión práctica onde se aplique en grupo algunha técnica aprendida (2h). 2. Factores e aspectos a considerar (2h) 3. Funcións a desenvolver e requisitos do obxecto (2h). 4. Elaboración de modelos. Compoñentes e ensamblaxe (4h) 5. Síntese e Avaliación (1h) 6. Entrega da documentación e presentación (*h)
2º PARTE - AUTOMATIZACIÓN DE ELEMENTOS EN PLANTA	-
1. Deseño e implantación de sistemas automáticos. (3 horas)	1.1.- Normativa seguridade de máquinas. 1.2.- Percorrido pola normativa. 1.3.- Modos de funcionamento. 1.3.1.- Organizacións características: 3 e 4 estados. 1.3.2.- Seguridades nos modos manuais. 1.3.3.- Outros modos. 1.3.4.- Outros aspectos relevantes na xestión de modos
2. Transductores e Accionamientos. (6 horas)	2.1.- Transductores. 2.1.1.- Características básicas. 2.1.2.- Clasificación segundo a magnitude física a medir. 2.2.- Dispositivos de actuación. 2.2.1.- Accionamientos e pre-accionamientos eléctricos. 2.2.2.1.- Variadores de frecuencia 2.2.2.- Accionamientos e pre-accionamientos pneumáticos. 2.3.- Automatismos básicos cableados. 2.3.1.- Automatismos pneumáticos e hidráulicos. 2.3.2.- Automatismos electromecánicos. 2.4.- Reguladores industriais.
3. Modelado de automatismos. (4 horas)	3.1.- Grafos de estados. 3.2.- Ampliación de Redes de Petri. 3.2.1.- Modelado de sistemas complexos. 3.2.2.- Concorrencia. 3.2.3.- Sincronización de tarefas. 3.2.4.- Modularidad.
4. Automatización mediante autómatas programables industriais. (3 horas)	4.1.- Tipos de automatización 4.2.- Elementos necesarios para automatizar 4.3.- Motivos para automatizar 4.4.- Estratexias de automatización 4.5.- Sistemas de cableado
5. Programación de autómatas. Linguaxes normalizadas. (4 horas)	5.1.- Linguaxes normalizadas 5.2.- Diagrama funcional de secuencias (SFC) 5.2.1.- Etapas. Transicións. 5.2.2.- Ramas alternativas. Saltos. Ramas simultáneas. 5.3.- Conceptos avanzados de SFC. 5.3.1.- Denominación das etapas. 5.3.2.- Accións asociadas a etapas. Accións condicionadas. 5.3.3.- Eventos e accións asociadas. 5.3.4.- Temporizaciones e contaxes.
6. Integración de Tecnoloxías. (6 horas)	6.1.- Integración 6.2.- Comunicacións industriais. 6.3.- Xerarquía de procesos. 6.4.- Xerarquía de redes industriais: Buses de campo. 6.5.- Sistemas de interfaz Home-Máquina. 6.5.1- Terminais de operador.
PRÁCTICAS DA 2ª PARTE	.
P1. Implantación dun sistema automático (2 horas)	Aplicación da normativa e modos de funcionamento.

P2. Variadores de frecuencia (2 horas)	Posta en funcionamento dun accionamiento baseado nun variador de frecuencia.
P3. Modelado de automatismos (2 horas)	Implantación dun sistema modelado mediante unha rede de Petri cun autómata programable.
P4. Cableado (2 horas)	Cableado dun sistema automático baseado nun autómata programable.
P5. Modelado normalizado (2 horas)	Implementación dun controlador programable utilizando ferramentas normalizadas de programación de autómatas.
P6. Buses de campo (2 horas)	Parametrización dun variador a través dun bus de campo.

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	52	78	130
Prácticas de laboratorio	24	36	60
Seminario	3	8	11
Aprendizaxe baseado en proxectos	3	6	9
Presentación	5	10	15

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

Metodoloxía docente

	Description
Lección maxistral	Sesión maxistral con participación activa dos estudantes. Cada unidade temática será presentada polo profesor empleando os recursos audiovisuales axeitados e complementada cos comentarios que os estudantes realicen en base á bibliografía recomendada ou ás ideas novedosas que poidan surdir. Durante as clases maxistrales plantexaranse exercicios para resolver parcial ou totalmente, de maneira individual ou grupal, orientados a facilitar a mellor comprensión dos contidos e métodos que capaciten para o seu aproveitamento na práctica do deseño.
Prácticas de laboratorio	Proponse a realización dun traballo de deseño (trD), a realizar ao longo do cuadrimestre, que requere de horas na casa además do apoio das sesións criativas en grupo e das titorías (nivel de dificultade en función da propia ambición de cada alumno), consistente nun deseño de produto e a correspondente proposta de comunicación do mesmo, ben partindo dun conxunto existente e dotándoo dalgunha innovación significativa, ben criando un novo produto (preferible). O proceso estará coordinado polo profesor desde a elección inicial do traballo a realizar, pasando polas sucesivas fases nas que o alumno terá que efectuar entregas parciais. Finalmente efectuará a presentación do produco deseñado e entregará a documentación pertinente
Seminario	Actividades de reforzo ó aprendizaxe mediante o desenvolvemento de sesións destinadas á percura de ideas novedosas de interese para os respectivos traballos ou ben a clarexar contidos teóricos, efectuar análises ou avaliacións de propostas, orientar, etc.
Aprendizaxe baseado en proxectos	Realización de actividades que necesariamente requiren do esforzo creativo, da atención, a participación activa e a colaboración dos estudiantes entre sí e co profesor, tal como sucede nas etapas criativas do proceso de deseño.
Presentación	Actividades de reforzo ó aprendizaxe mediante o desenvolvemento de sesións destinadas á percura de ideas novedosas de interese para os respectivos traballos ou ben ó clarexamento de contidos teóricos, efectuar análises ou avalacións de propostas, orientar, etc.

Atención personalizada

Methodologies	Description
Seminario	Os profesores atenderán persoalmente as dúbidas e consultas dos alumnos, tanto nas horas presenciais como nas de titoría, ademais de contestar as suxestións recibidas vía e-mail, teléfono ou mediante foros compartidos (FAITIC, onde estarán os diversos temas en soporte electrónico).
Presentación	Os profesores atenderán persoalmente as dúbidas e consultas dos alumnos, tanto nas horas presenciais como nas de titoría, ademais de contestar as suxestións recibidas vía e-mail, teléfono ou mediante foros compartidos (FAITIC, onde estarán os diversos temas en soporte electrónico).
Aprendizaxe baseado en proxectos	Os profesores atenderán persoalmente as dúbidas e consultas dos alumnos, tanto nas horas presenciais como nas de titoría, ademais de contestar as suxestións recibidas vía e-mail, teléfono ou mediante foros compartidos (FAITIC, onde estarán os diversos temas en soporte electrónico).

Avaliación

	Description	Qualification	Evaluated Competencess		
Lección maxistral	Exame final	50-80	CG3	CE12	CT3 CT16

Prácticas de laboratorio	Traballo práctico	50-20	CG3	CE12	CT6 CT8 CT9 CT14 CT16 CT17 CT20

Other comments on the Evaluation

Dada a composición da materia, cada un dos dous bloques de contidos deberá superarse individualmente para alcadar o aprobado da mesma.

1º BLOQUE DE CONTIDOS:

Cada proba, traballo ou informe será valorado sobre 10 puntos. Para superar o primeiro bloque pola vía de avaliación continua o alumno deberá alcanzar un mínimo de 5 en cada unha das súas partes (teoría e prácticas). A cualificación total deste bloque obterase aplicando as seguintes porcentaxes: Teoría 50%, Prácticas (traballo) 50%. A parte teórica consiste fundamentalmente nunha proba escrita, que poderá ser tipo test. A parte práctica consiste no deseño dun obxecto, con entregas parciais e a final, que ademais inclúe unha exposición.

Aqueles alumnos que sigan a vía de avaliación continua poderán conservar a cualificación das partes superadas ata a convocatoria de xullo, debendo recuperar só aquelas non superadas.

Quen opten pola vía do exame final exclusivamente, realizarán tanto a parte teórica (50%), que poderá conter preguntas de resposta longa, como a práctica (50%). Para superar este bloque deberán alcanzar un mínimo de 5 puntos en cada unha destas partes. Se superan algunha delas consérvaselle ata a 2ª convocatoria (xullo).

2º BLOQUE DE CONTIDOS:

Proba oral/escrita (80% da nota final). Realizarase un exame final sobre os contidos da materia que incluirá problemas e exercicios. Avaliación das Prácticas (20% da nota final). Realizarase unha Avaliación Continua do traballo de cada alumno nas prácticas. Se esta Avaliación Continua non se supera ao longo do cuadrimestre, o alumno terá dereito a un exame de prácticas para poder superar a avaliación das prácticas.

Deberanse superar ambas as partes (exame oral/escrito e prácticas) para aprobar este bloque da materia.

Na 2ª convocatoria do mesmo curso o alumno deberá examinarse das partes non superadas na 1ª convocatoria. Deberanse superar ambas as partes (exame oral/escrito e prácticas) para aprobar a materia.

Espérase que o alumno presente un comportamento ético axeitado. No caso de detectar un comportamento non ético (copia, plaxio, utilización de aparatos electrónicos non autorizados, e outros) considerarase que o alumno non reúne os requisitos necesarios para superar a materia. Neste caso a cualificación global no presente curso académico será de suspenso (0.0). Non se permitirá a utilización de ningún dispositivo electrónico durante as probas de avaliación, salvo autorización expresa.

Bibliografía. Fontes de información

Basic Bibliography

Boothroyd, G., et. al., **Product Design for Manufacture and Assembly**, 3ª, CRC Press, 2011

Lidwell, William; Holden, Kritina ; Butler, Jill, **Principios Universales de Diseño**, Blume (Naturart), 2011

Lidwell, William; Holden, Kritina ; Butler, Jill, **Universal Principles of Design**, Rockport Publishers, 2010

Mandado, E.; Marcos, J.; et al., **Autómatas Programables y Sistemas de Automatización**, 2ª, Marcombo, 2009

Nordin, Margareta; Frankel, Victor, **Biomecánica Básica del Sistema Musculoesquelético**, 3ª, McGraw Hill Interamericana, 2004

Complementary Bibliography

Bayley, S., **Guía Conran del diseño**, Alianza, 1992

Galán, J.; et al., **El Diseño Industrial en España**, Cátedra, 2010

García Melón, M.; et al., **Fundamentos del diseño en la ingeniería**, Editorial de UPV, 2009

Gomez Senent, E, **Teoría y metodología del proyecto**, Editorial de UPV, 2008

Nordin, Margareta; Frankel, Victor, **Basic Biomechanics of the Musculoskeletal System**, 4ª, Wolters Kluwer, 2012

Porras, A. & Montero, A.P, **Autómatas Programables. Fundamento. Manejo. Instalación y Práctica**, McGraw-Hill, 1990

Romera, J.P; Lorite, J.A; Montoro, S., **Automatización. Problemas resueltos con autómatas programables**, Paraninfo, 2002

Recomendacións

Subjects that continue the syllabus

Sistema para o deseño e desenvolvemento do produto/V12G380V01934

Subjects that it is recommended to have taken before

Expresión gráfica: Expresión gráfica/V12G380V01101
Fundamentos de automática/V12G380V01403
Enxeñaría gráfica/V12G380V01602

Other comments

Para matricularse nesta materia é necesario superar ou ben estar matriculado de todas as materias dos cursos inferiores ao curso no que está emprazada esta materia. De maneira moi especial, recoméndase superar previamente as tres materias sinaladas no apartado anterior.

Plan de Continxencias

Description

=== MEDIDAS EXCEPCIONAIS PLANIFICADAS ===
Ante a incerta e imprevisible evolución da alerta sanitaria provocada pola COVID- 19, a Universidade establece una planificación extraordinaria que se activará no momento en que as administracións e a propia institución o determinen atendendo a criterios de seguridade, saúde e responsabilidade, e garantindo a docencia nun escenario non presencial ou non totalmente presencial. Estas medidas xa planificadas garanten, no momento que sexa preceptivo, o desenvolvemento da docencia dun xeito mais áxil e eficaz ao ser coñecido de antemán (ou cunha ampla antelación) polo alumnado e o profesorado a través da ferramenta normalizada e institucionalizada das guías docentes DOCNET.

=== ADAPTACIÓN DAS METODOLOXÍAS ===
* Metodoloxías docentes que se manteñen
Non cambia
* Metodoloxías docentes que se modifican
Non cambia
* Mecanismo non presencial de atención ao alumnado (titorías)
Realizarase por medios telemáticos: salas virtuais, email, teléfono
* Modificacións (si proceden) dos contidos a impartir
Non cambia
* Bibliografía adicional para facilitar o auto-aprendizaxe
Non cambia
* Outras modificacións

=== ADAPTACIÓN DA AVALIACIÓN ===
* Probas xa realizadas
1º BLOQUE DE CONTIDOS
Exame final: [Peso anterior 50%] [Peso Proposto 20%]
Traballo práctico: [Peso anterior 50%] [Peso Proposto 80%]
2º BLOQUE DE CONTIDOS
Non cambia
...

* Probas pendentes que se manteñen
1º BLOQUE DE CONTIDOS
Exame final: [Peso anterior 50%] [Peso Proposto 20%]
Traballo práctico: [Peso anterior 50%] [Peso Proposto 80%]
2º BLOQUE DE CONTIDOS
Non cambia
...

* Probas que se modifican
Ningunha

* Novas probas
Ningunha

* Información adicional

Con respecto ao texto da guía inicial faranse os seguintes cambios:
1º BLOQUE DE CONTIDOS
Cámbiase a expresión "proba escrita" por: "proba oral/escrita".
Cámbiase a frase "Quen opten pola vía do exame final exclusivamente, realizarán tanto a parte teórica (50%), que poderá conter preguntas de resposta longa, como a práctica (50%)", por esta: "Quen opten pola vía do exame final exclusivamente, realizarán tanto a parte teórica (20%) como a práctica (80%). O exame poderá ser oral ou escrito, e poderá ser tipo test ou conter preguntas de resposta longa".
Suprímense/elimínanse as frases "Para superar o primeiro bloque pola vía de avaliación continua o alumno deberá alcanzar un mínimo de 5 en cada unha das súas partes (teoría e prácticas)", e "Para superar este bloque deberán alcanzar un mínimo de 5 puntos en cada unha destas partes".
2º BLOQUE DE CONTIDOS
Non cambia

IDENTIFYING DATA				
Selección de materiais e fabricación de medios de produción				
Subject	Selección de materiais e fabricación de medios de produción			
Code	V12G380V01932			
Study programme	Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	9	Optional	4	1c
Teaching language	Castelán			
Department	Deseño na enxeñaría Enxeñaría dos materiais, mecánica aplicada e construción			
Coordinator	Diéguez Quintas, José Luís Abreu Fernández, Carmen María			
Lecturers	Abreu Fernández, Carmen María Diéguez Quintas, José Luís			
E-mail	cabreu@uvigo.es jdieguez@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description				

Competencias	
Code	
CG1	CG1 Capacidade para a redacción, sinatura e desenvolvemento de proxectos no ámbito da enxeñaría industrial, na especialidade de Mecánica, que teñan por obxecto, a construción, reforma, reparación, conservación, demolición, fabricación, instalación, montaxe ou explotación de: estruturas, equipos mecánicos, instalacións enerxéticas, instalacións eléctricas e electrónicas, instalacións e plantas industriais, e procesos de fabricación e automatización.
CG3	CG3 Coñecemento en materias básicas e tecnolóxicas que os capacite para a aprendizaxe de novos métodos e teorías, e os dote de versatilidade para adaptarse a novas situacións.
CG4	CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial na especialidade de Mecánica.
CG5	CG5 Coñecementos para a realización de medicións, cálculos, valoracións, taxacións, peritaxes, estudos, informes, planes de labores e outros traballos análogos.
CG6	CG6 Capacidade para o manexo de especificacións, regulamentos e normas de obrigado cumprimento.
CG8	CG8 Capacidade para aplicar os principios e métodos da calidade.
CE25	CE25 Coñecementos e capacidades para a aplicación da enxeñaría de materiais.
CE26	CE26 Coñecemento aplicado de sistemas e procesos de fabricación, metroloxía e control da calidade.
CT5	CT5 Xestión da información.
CT6	CT6 Aplicación da informática no ámbito de estudo.
CT7	CT7 Capacidade para organizar e planificar.
CT9	CT9 Aplicar coñecementos.
CT10	CT10 Aprendizaxe e traballo autónomos.
CT17	CT17 Traballo en equipo.

Resultados de aprendizaxe			
Learning outcomes		Competences	
Coñece as novas tendencias de materiais e os seus procesos de conformación.		CE25 CE26	CT10
Selecciona materiais en función das súas propiedades físicas, químicas, mecánicas, térmicas, eléctricas e magnéticas		CE25	CT5
Desenvolve estratexias de selección de materiais tendo en conta os límites nas súas propiedades, as súas capacidades de conformación, unión, acabado e sustentabilidade.		CE25 CE26	CT7 CT9
Utiliza bases de datos para tomar decisións sobre a correcta selección do material para un determinado compoñente ou estrutura.		CE25	CT6
Asocia as posibilidades de deseño a cada proceso de transformación de materiais	CG4	CE25 CE26	
Utiliza programas de simulación de procesos asistida por computador.	CG6	CE26	CT5 CT9

Selecciona, deseña e optimiza os procesos de transformación para un material en función do deseño, uso do produto e o seu impacto ambiental.	CG3	CE25 CE26	
Propón solucións innovadoras de produto en base aos materiais e os seus procesos. Analiza e propón solucións operativas a problemas no ámbito da enxeñaría de materiais		CE25 CE26	
Coñece e valora o proceso experimental utilizado nos procesos de fabricación así como coñecer os medios e *utillajes necesarios.	CG4	CE26	
Domina os coñecementos básicos para a elaboración de proxectos de *utillajes e ferramentas de fabricación. Profunda nas técnicas de fabricación e innovacións na fabricación de *utillajes e ferramentas.		CE26	CT7 CT17
Demostra capacidades de comunicación e traballo en equipo. Identifica as propias necesidades de información e utiliza os medios, espazos e servizos dispoñibles para deseñar e executar procuras adecuadas ao ámbito temático. Leva a termo os traballos encomendados a partir das orientacións básicas dadas polo profesor, decidindo a duración das partes, incluíndo achegas persoais e ampliando fontes de información.	CG1 CG5 CG6 CG8	CE25 CE26	CT5 CT9 CT17

Contidos	
Topic	
*T1.-SELECCIÓN DE MATERIAIS	01. O mundo dos materiais. Diferentes familias. Características. 02. Materiais en función das súas propiedades mecánicas. 03. Materiais en función das súas propiedades térmicas, eléctricas, ópticas e magnéticas. 04 Materiais en función das súas propiedades químicas. 05. Estudo dos procesos de degradación dos materiais. Formas de previla 06. Mapas de selección de materiais. Índices de materiais. 07. Selección de materiais en función do seu impacto ambiental e *reciclabilidad. 08. Metodoloxía de selección dos materiais máis adecuados en función do deseño do produto. 09. Procesos transformación dos materiais para a mellora na súa vida en servizo. 10. A selección dos materiais e procesos aplicados aos produtos dos principais sectores industriais.
*T2.- FABRICACIÓN DE MEDIOS DE PRODUCIÓN	01 Fabricación *aditiva: tecnoloxías e características. 02 *Electroerosión: planificación do proceso e fabricación eléctrodos 03 Procesado de materiais *pétreos 04 Procesado de madeira e afíns. 05 Forzas e enerxías en diferentes procesos de fabricación 06 Procesado de materiais compostos. 07 Deseño orientado á fabricación 08 Soldadura procesos avanzados e equipos 09 *Utillajes e control 10 Ferramentas de corte: fabricación e selección
*P1.- PRÁCTICAS DE SELECCIÓN MATERIAIS	01. Usos de bases de datos de materiais. 02. Construción e manexo dos mapas de materiais. Índices de materiais. 03. Avaliación da degradación de materiais metálicos. 04. Métodos de protección de materiais metálicos. 05. Avaliación da degradación e protección de materiais non metálicos. 06. Estimación do comportamento dos materiais compostos. 07. Selección de materiais e procesos aplicados a produtos dos principais sectores industriais. Casos prácticos. 08 Visita a empresa. 09 Exposición de traballos prácticos.
*P2.- PRACTICAS DE FABRICACIÓN DE MEDIOS DE PRODUCIÓN	01 Fabricación de pezas por métodos aditivos 02 Fabricación eléctrodo 03 *Electroerosión: realización de cavidade 04 Medición con e sen contacto 05 *Fundicion e moldeo 06 Soldadura: *influecia de parámetros no proceso 07 Fabricación de *utillaje mecanizado e deseño de maqueta de control 08 Visita a empresa 09 Exposición de traballos prácticos

Planificación			
	Class hours	Hours outside the classroom	Total hours
Lección maxistral	39	0	39
Prácticas de laboratorio	20	0	20

Prácticas con apoio das TIC	16	0	16
Aprendizaxe baseado en proxectos	0	48	48
Exame de preguntas obxectivas	0	2	2
Práctica de laboratorio	0	50	50
Traballo	0	50	50

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

Metodoloxía docente

	Description
Lección maxistral	As clases teóricas realizaranse combinando as explicacións de lousa co emprego de vídeos e presentacións de computador. A finalidade destas é complementar o contido dos apuntamentos, interpretando os conceptos nestes expostos mediante a mostra de exemplos e a realización de exercicios.
Prácticas de laboratorio	As clases prácticas de laboratorio realizaranse empregando os recursos dispoñibles de instrumentos e máquinas, combinándose coas simulacións por computador e visitas a empresas.
Prácticas con apoio das TIC	Na aula informática empregarase o programa CES-*Edupack para a selección de materiais e procesos
Aprendizaxe baseado en proxectos	

Atención personalizada

Methodologies	Description
Lección maxistral	
Prácticas de laboratorio	
Prácticas con apoio das TIC	

Tests	Description
Práctica de laboratorio	
Traballo	

Avaliación

	Description	Qualification	Evaluated Competencess		
Exame de preguntas obxectivas	Carácter: esta proba será única para todos os contidos da materia, escrita e presencial. É obrigatoria para todos os alumnos, con ou sen avaliación continua. Contido: estará composta esta proba por 24 preguntas tipo test sobre os contidos teóricos e prácticos. Criterios de valoración: a valoración de próbaa tipo test realizarase nunha escala de 6 puntos, o que representa o 60% da nota total, sendo necesario obter polo menos 2 puntos, para que co resto das probas póidase obter polo menos 5 puntos e superar a materia. Cualificación: a nota deste test obterase sumando 0,25 puntos por cada cuestión correctamente contestada e restaranse 0,1 puntos se a cuestión é resolta de forma incorrecta. As cuestións en branco non puntúan.	60	CG4	CE25 CE26	
Práctica de laboratorio	Carácter: esta proba é común para todos os contidos da materia e obrigatoria para todos os alumnos con avaliación continua. Contido: das dúas visitas prácticas que se realizarán, o alumno redactará un informe. Cualificación: valor máximo de 1 punto.	10	CG5		CT7 CT9 CT17
Traballo	Carácter: esta proba é común para todos os contidos da materia e obrigatoria para todos os alumnos con avaliación continua. Contido: realización dun traballo ou proxecto que integre os dous temas da materia, nos termos especificados na plataforma TEMA (www.faitic.uvigo.es) e o seu posterior defensa oral. Cualificación: valor máximo de 3 puntos.	30	CG1 CG4 CG5 CG6 CG8	CE25 CE26	CT5 CT10 CT17

Other comments on the Evaluation

Alumnos con avaliación continua: cualificación
na convocatoria de 2º edición:Esta segunda edición da convocatoria
ordinaria cualificarase da seguinte maneira:-&*nbsp;&*nbsp;&*nbsp;Un exame tipo test por valor de 6 puntos en termos iguais aos especificados para a 1º edición.-&*nbsp;&*nbsp;&*nbsp;&*nbsp;Manterase a puntuación alcanzada na proba práctica de visita a empresa (1 punto).-&*nbsp;&*nbsp;&*nbsp; Os 3 puntos do traballo ou proxecto mantense, existindo a posibilidade de refacer o traballo para mellorar esta nota.&*nbsp;Alumnos

aos que se lles concedeu polo
centro o poder ser cualificados sen avaliación continua:O mesmo día que se realice próbaa test
obrigatoria, nas dúas edicións da convocatoria ordinaria, á súa finalización
deberán realizar un segundo exame consistente na resolución de varios
problemas prácticos, cuxo valor será o 40% da nota final, ou sexa como máximo
4 puntos, sendo necesario obter un mínimo de 1,5 puntos nesta segunda
proba para que a cualificación póidase sumar á de próbaa tipo test, e
se iguala ou supera 5 puntos, aprobar a materia.Convocatoria extraordinaria:O exame de convocatoria extraordinaria
abarca contidos teóricos e prácticos da materia por valor de 10 puntos da
seguinte maneira:- Exame tipo test de 24 preguntas tipo test,
cun valor de 6 puntos, a nota deste test obterase sumando 0,25 puntos
por cada cuestión correctamente contestada e restaranse 0,1 puntos se a
cuestión é resolta de forma incorrecta. As cuestións en branco non puntúan.
É necesario obter polo menos 2 puntos neste exame.- Exame contidos prácticos &*nbsp;mediante
varios problemas, cuxo valor será como máximo 4 puntos, sendo necesario
obter un mínimo de 1,5 puntos.Para superar esta materia é necesario polo menos
obter 5 puntos sumando as dúas anteriores probas.&*nbsp;Compromiso ético:Espérase que o alumno presente un
comportamento ético adecuado, libre de fraude. En caso de detectar un
comportamento non ético (copia, plaxio, utilización de aparellos electrónicos non
autorizados, por exemplo) considerarase que o alumno non reúne os requisitos
necesarios para superar a materia. Neste caso a cualificación global no
presente curso académico será de suspenso (0,0).

Bibliografía. Fontes de información

Basic Bibliography

Ashby, M.F., **Materials Selection in Mechanical Design**, Fourth edition,

Otero Huerta, E, **Corrosión y degradación de materiales**, 2º Edición,

Black, J.T., Kohser, R.A., **Degarmo□s Materials and Processes in Manufacturing**,

Boothroyd, G. (Geoffrey), **Product design for manufacture and assembly**,

Kalpakjian, Serope, **Manufactura, ingeniería y tecnología**,

Complementary Bibliography

Diéguez Quintas, José Luis, **Fundamentos de fabricación mecánica**,

Moore, Harry D., **Materiales y procesos de fabricación : industria metalmecánica y de plásticos**,

Alejandro Pereira Domínguez, José L. Diéguez Quintas, **Tecnologías y sistemas de fabricación**,

Ashby, M.F., **Materiales para ingeniería.V1**,

Ashby, M.F., **Materiales para ingeniería.V2**,

Recomendacións

Subjects that it is recommended to have taken before

Ciencia e tecnoloxía dos materiais/V12G380V01301
Fundamentos de sistemas e tecnoloxías de fabricación/V12G380V01305
Resistencia de materiais/V12G380V01402
Enxeñaría de fabricación e calidade dimensional/V12G380V01604
Enxeñaría de materiais/V12G380V01504

Other comments

Estará a disposición dos alumnos toda a documentación necesaria para o seguimento desta materia na plataforma TEMA (www.faitic.uvigo.es).

Requisitos: Para matricularse desta materia é necesario ter superado ou ben estar matriculado de todas as materias dos cursos inferiores ao curso ao que está emprazada esta materia.

En caso de discrepancias, prevalecerá a versión en castelán desta guía.

Plan de Continxencias

Description

Os contidos e os resultados de aprendizaxe non deberán ser modificados para poder garantir o recollido nas memorias da titulación. Debe tratarse de axustar os materiais, titorías e as metodoloxías docentes para tratar de acadar estes resultados. Trátase dun aspecto de grande importancia para a superación dos procesos de acreditación a que están sometidas as

diferentes titulacións. E dicir, o plan de continxencia debe basearse nun desenvolvemento da materia, adaptando as metodoloxías e os materiais, na procura do cumprimento dos resultados de aprendizaxe de todo o alumnado.

As metodoloxías docentes se impartirán, de ser necesario, adecuándoas ós medios telemáticos que se poñan a disposición do profesorado, ademais da documentación facilitada a través de FAITIC e outras plataformas, correo electrónico, etc.

Cando non sexa posible a docencia presencial, na medida do posible, primarase a impartición dos contidos teóricos por medios telemáticos así como aqueles contidos de prácticas de resolución de problemas, aula de informática, e outros, que poidan ser virtualizados ou desenvolvidos polo alumnado de xeito guiado, intentado manter a presencialidade para as prácticas experimentais de laboratorio, sempre que os grupos cumpran coa normativa establecida no momento polas autoridades pertinentes en materia sanitaria e de seguridade. No caso de non poder ser impartida de forma presencial, aqueles contidos non virtualizables se impartirán ou suplirán por outros (traballo autónomo guiado, etc.) que permitan acadar igualmente as competencias asociados a eles. As titorías poderán desenvolverse indistintamente de forma presencial (sempre que sexa posible garantir as medidas sanitarias) ou telemáticas (e-mail e outros) respectando ou adaptando os horarios de titorías previstos. Asemade, farase unha adecuación metodolóxica ó alumnado de risco, facilitándolle información específica adicional, de acreditarse que non pode ter acceso ós contidos impartidos de forma convencional.

Información adicional sobre a avaliación: manteranse aquelas probas que xa se veñen realizando de forma telemática e, na medida do posible, manteranse as probas presenciais adecuándoas á normativa sanitaria vixente. As probas se desenvolverán de forma presencial salvo Resolución Reitoral que indique que se deben facer de forma non presencial, realizándose dese xeito a través das distintas ferramentas postas a disposición do profesorado. Aquelas probas non realizables de forma telemática se suplirán por outros (entregas de traballo autónomo guiado, etc.)

IDENTIFYING DATA				
Systems for data analysis, simulation and validation				
Subject	Systems for data analysis, simulation and validation			
Code	V12G380V01933			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	4th	1st
Teaching language	Spanish			
Department				
Coordinator	Suárez Eiroa, David			
Lecturers	Suárez Eiroa, David			
E-mail	dsuarez@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	Design, calculation and analysis of elements of machines			

Competencies	
Code	
CG1	CG1 Skills for writing, signing and developing projects in the field of industrial engineering, whose purpose, specializing in Mechanics, construction, alteration, repair, maintenance, demolition, manufacturing, installation, assembly or operation of: structures, mechanical equipments, energy facilities, electrical systems and electronic installations and industrial plants, and manufacturing processes and automation.
CG3	CG3 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.
CG4	CG4 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.
CE19	CE19 Knowledge and skills to apply the techniques of engineering graphics.
CE20	CE20 Knowledge and abilities to calculate, design and test machines.
CT2	CT2 Problems resolution.
CT9	CT9 Apply knowledge.
CT10	CT10 Self learning and work.
CT17	CT17 Working as a team.

Learning outcomes	Competences		
Know and apply the computational technicians of simulation to the mechanical design.	CG1	CE19	CT2
Know and apply the computational technicians for the classical calculation of design of machines.	CG3	CE20	CT9
Know and apply the computational technicians of numerical analysis in the design of machines.	CG4		CT10
			CT17

Contents	
Topic	
Presentation of the subject	-Introduction to the matter, planning and evaluation -Previous knowledges: design of machines; theory of mechanisms; materials
Gears	- Definition and context - Theoretical calculation and selection - Software of calculation
Axes and shafts	- Definition and context - Theoretical calculation and selection - Software of calculation
Bearings	- Definition and context - Theoretical calculation and selection - Software of calculation
Tolerances of elements of machine	-Dimensional and geometrical tolerances -Interpretation of manufacturing and assembly drawgins
Unions between elements of machine	-Bolted unions -Shaft-Cube unions -Welding unions

Advanced design and integration in engineering	-Pneumatic systems: linear, totative and vacuum -Design and import of elements of machine -Module of metalsheet and welding -Calculation of pieces and assemblies

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	14.5	10	24.5
Problem and/or exercise solving	4	10	14
Laboratory practice	30	40	70
Project	1.5	40	41.5
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Lecturing	Exhibition of subjects of the subject

Personalized assistance	
Tests	**Description**
Problem and/or exercise solving	Personalised attention to the *alumn@ for the resolution of problems and/or exercisesproposed.
Project	Personalised attention to the *alumn@ to solve the doubts arisen developingof the works and projects

Assessment					
	Description	Qualification	Evaluated Competencess		
Problem and/or exercise solving	Resolution of exercises and theoretical short questions and of reasoning	40	CG1 CG3 CG4	CE19 CE20	CT2 CT9 CT10
Laboratory practice	Questions about the exercises made in the practices of laboratory	20	CG3 CG4	CE19 CE20	CT2 CT9 CT10 CT17
Project	Resolution of a realistic case proposed.	40	CG4		CT2 CT9 CT10 CT17

Other comments on the Evaluation

The subject will approve if it obtains an equal qualification or elder that a 5 like final note. For this 40% of the note corresponds with the resolution of exercises and answers to short questions of the contents of theory and practical; 20% achieves from the exercises made in practices of laboratory; 40% will come of a project proposed to make during the semester.In any case is necessary to obtain 30% in each one of the three sections exposed previously to approve the subject.

Ethical commitment: it expects that the present student a suitable ethical behaviour. In the case to detect a no ethical behaviour (copy, plagiarism, utilisation of unauthorised electronic devices, and others) considers that the student does not gather the necessary requirements to surpass the matter. In this case the global qualification in the current academic course will be of suspense (0.0).
Will not allow the utilisation of any electronic device during the proofs of evaluation except permission expresses. The fact to enter an unauthorised electronic device in the classroom of examination will be considered reason of no *superación of the matter in the present academic course and the global qualification will be of suspense (0.0).

Sources of information

Basic Bibliography

varios autores, **Diseño en Ingeniería Mecánica de Shigley**, 0, McGraw-Hill, 0

Complementary Bibliography

Norton, R., **Diseño de Máquinas**, Pearson, 2000
Mott, R.L., **Diseño de elementos de máquinas**, 0, Pearson, 2006

Larburu, N., **Máquinas prontuario. Técnicas, máquinas, herramientas**, Paraninfo, 1989

Recommendations

Subjects that it is recommended to have taken before

Resistance of materials/V12G380V01402
Mechanism and machine theory/V12G380V01306
Machine design I/V12G380V01304

Other comments

The students that want to *cursar these two subjects will have to show sufficient basic knowledges of the reality of the engineering of machines.

Said sufficiency will consider achieved having worked the contents of the following matters:

- Resistance of materials
- Theory of machines and mechanisms
Design of machines I

Therefore it would be recommended to have *cursado said matters of previous form in the inferior courses to take advantage of the matter with guarantees.

In case of discrepancies will prevail the version in Spanish of this guide.

Contingency plan

Description

=== EXCEPTIONAL MEASURES SCHEDULED ===
In front of the uncertain and unpredictable evolution of the sanitary alert caused by the *COVID-19, the University of Vigo establishes an extraordinary planning that will activate in the moment in that the administrations and the own institution determine it attending to criteria of security, health and responsibility, and guaranteeing the teaching in a no face-to-face stage or partially face-to-face. These already scheduled measures guarantee, in the moment that was prescriptive, the development of the teaching of a more agile and effective way when being known in advance (or with a wide *antelación) by the students and the *profesorado through the tool normalised and institutionalised of the educational guides.

=== ADAPTATION OF THE METHODOLOGIES ===
* educational Methodologies that keep and modify
In the case to be necessary, would use mechanisms of virtual classroom to carry out theoretical and practical classes. Once it have taken the dynamics of classes and work, to measure that advances the course the students would have capacity to make the tasks of a more independent form.

* Mechanism no face-to-face of attention to the students (*tutorías)
would use email and in case of not being sufficient, would proceed to use some system of on-line communication to way meeting.

* Modifications (if they proceed) of the contents to give
The contents will keep independently of the situation.

=== ADAPTATION OF THE EVALUATION ===
The proofs will keep of the same form that the course was face-to-face or no face-to-face, since it would not see affected to the hour to make the evaluation.

=== ANOTHER INFORMATION ===
estimates an average of some 30 students in the subject taking into account data of previous years.
In the case of the sessions of classroom, is used to to assist 70% of the students, by which these could exert respecting the distances of security in the classroom assigned to the subject of face-to-face form. Anyway and to be necessary, the teaching of hours of theory could make of form no face-to-face to measure that goes advancing the course; once explained the dynamics of classes could happen to work by means of virtual classrooms.
In the case of the classes of laboratory alternate weeks of one and two practices so that they complete the 15 sessions.
When being two subgroups from theory, is used to to have an average of 10-12 people in the Classroom of Computer-4 or in

the Laboratory of Mechanical Engineering, by what equally could keep the distances of security, although have of the classroom of theory to do the practices also would be an option that would solve the subject. Of equal way, if they do the first practices of face-to-face form so that the students familiarise with the software to use and take *soltura, could pose the rest of the practices of form no face-to-face. Said this:
-The *presencialidad in the classes of laboratory goes to suppose an elder *aprovechamiento of the matter by part of the students, since it will be easier to solve the doubts that arise during his work and *interactuar in discussions of classroom about obtained and possible results alternative.
-They pose in the first weeks those sessions that require of more work by part of the professor, and to the end those sessions that require of a more autonomous work by part of the student.
-They have *intercalado with the theory so that they would give the 15 practices between the weeks 2 and 11 (week 1 hardly contained to explain the matter and system of work) and therefore #finish with two weeks of *antelación.
-The students need licences of software to be able to do the project and work from house or from the classroom of theory in case to move the practices to the classroom.

IDENTIFYING DATA				
Sistema para o deseño e desenvolvemento do produto				
Subject	Sistema para o deseño e desenvolvemento do produto			
Code	V12G380V01934			
Study programme	Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	4	2c
Teaching language	Galego			
Department	Deseño na enxeñaría			
Coordinator	Pérez Vázquez, Manuel			
Lecturers	Alegre Fidalgo, Paulino Pérez Vázquez, Manuel			
E-mail	maperez@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	O obxectivo que se persegue con esta materia é orientar ao futuro profesional a partir do coñecemento, manexo e aplicación das ferramentas CAD integradas ao CAM/CAE, concibidas para o deseño e desenvolvemento do conxunto-produto. Outros obxectivos son: -Coñecer as ferramentas e tecnoloxías CAD orientadas ao conxunto-produto. -Comprender como se realiza a xestión do Ciclo de Vida de Produto na estrutura de datos da empresa. -Coñecer os Sistemas Expertos dispoñibles actualmente para deseño e fabricación integrados. -Adquirir habilidades no manexo de Sistemas de modelado de sólidos orientado ao grupo e no deseño paramétrico. -Adquirir criterio para seleccionar as tecnoloxías e ferramentas apropiadas en cada caso para o deseño asistido, a fabricación automatizada, a definición do produto, a súa comunicación e a enxeñaría inversa. -Adquirir conceptos e destrezas para xeración de planos e documentos a partir de xeometrías tridimensionais. -Coñecer e aplicar as técnicas creativas axeitadas para cada problema creativo.			

Competencias	
Code	
CG1	CG1 Capacidade para a redacción, sinatura e desenvolvemento de proxectos no ámbito da enxeñaría industrial, na especialidade de Mecánica, que teñan por obxecto, a construción, reforma, reparación, conservación, demolición, fabricación, instalación, montaxe ou explotación de: estruturas, equipos mecánicos, instalacións enerxéticas, instalacións eléctricas e electrónicas, instalacións e plantas industriais, e procesos de fabricación e automatización.
CT2	CT2 Resolución de problemas.
CT5	CT5 Xestión da información.
CT8	CT8 Toma de decisións.
CT9	CT9 Aplicar coñecementos.
CT10	CT10 Aprendizaxe e traballo autónomos.
CT14	CT14 Creatividade.
CT17	CT17 Traballo en equipo.

Resultados de aprendizaxe		
Learning outcomes		Competences
Coñecer as ferramentas e tecnoloxías CAD orientadas ao conxunto-produto.	CG1	CT10 CT17
Comprender como se realiza a xestión do Ciclo de Vida do Produto na estrutura de datos da empresa.		CT5
Coñecer os Sistemas Expertos dispoñibles actualmente para o deseño e fabricación integrados.		CT9 CT17
Adquirir habilidades no manexo de Sistemas de modelado de sólidos orientado ao grupo e no deseño paramétrico.		CT14
Adquirir criterio para seleccionar as tecnoloxías e ferramentas apropiadas en cada caso para o deseño asistido, a fabricación automatizada, a definición do produto, a comunicación do produto e a enxeñaría inversa.		CT2 CT8 CT14
Adquirir conceptos e destrezas para a xeración de planos e documentos a partir de xeometrías tridimensionais.	CG1	CT9
Nova		CT9 CT14

Contidos

Topic	
1. O DESENVOLVEMENTO DE NOVOS PRODUCTOS	1.1 Conceptos, definicións e aspectos implicados. 1.2 O proceso de deseño. Etapas e características. 1.3 O ciclo de vida do produto. 1.4 A Interacción co entorno. 1.5 Socioloxía do producto. 1.6 Proceso de desenvolvemento e enxeñaría do produto. 1.7 Leis fundamentais do deseño. 1.8 Fases a nivel de macroestructura e microestructura.
2. METODOLOXÍA PROXECTUAL	2.1 Factores. 2.2 Especificacións do produto (EDPs). 2.3 Prego de condicións (PDC) 2.4 Deseño conceptual e deseño de detalle. 2.5 Documentación. 2.6 Validación.
3. TECNOLOXÍAS BASEADAS NO COMPUTADOR (CAx)	3.1 Tecnoloxías que interveñen nas distintas etapas da vida dun produto (CAx) 3.2 Tecnoloxías CAD 3.3 Tecnoloxías CAE 3.3.1 MEF 3.4 Tecnoloxías CAM
4. MODELOS E PROTOTIPOS	4.1 Tipos de Modelos. Clásicos, virtuais, realistas. 4.2 Modelos CAD 2D e 3D. Asociatividade na oinformación. 4.3 Modelos para o cálculo automatizado. 4.4 Validación do deseño. Simulacións / Testing.
5. TÉCNICAS CREATIVAS	5.1 Introdución. Principais técnicas creativas. 5.2 O Brainstorming e as súas variantes. 5.3 O TRIZ. 5.4 Pensamento lateral: técnicas de E. De Bono. 5.5 As analoxías e outras técnicas. 5.6 Aplicacións: sesións creativas. 5.7 Valoración de alternativas / conceptos.
6. ENXEÑARÍA CONCORRENTE	6.1 Introducción. 6.2 Características básicas 6.3 Criterios para un entorno concorrente. 6.4 Deseño e desenvolvemento de produto en entornos de enxenaría concorrente e de enxenaría distribuida.
7. XESTIÓN DA INFORMACIÓN NA EMPRESA. FORMATOS DE INTERCAMBIO.	7.1 Xestión da información gráfica e control de revisións. 7.2 Sistemas de Xestión de Datos do Producto (PDM). 7.3 Xestión do ciclo de vida do produto. Sistemas PLM. Topoloxías, estándares e alternativas de interconexión. 7.4 Formatos estándar para gráficos CAD. ACIS, IGES, STEP y XML. Limitacións e recomendacións. 7.5 A pirámide CIM na empresa. Niveis e fluxo de información gráfica.
8. DESPREGAMENTO DA FUNCIÓN DE CALIDADE (QFD)	8.1 Espectativas do cliente e calidade. 8.2 Análise funcional. O FAST. 8.3 Despregamento da función de calidade. 8.4 A casa da calidade. Elaboración da mesma.
9. DESEÑO PARAMÉTRICO	9.1 Concepto e características 9.2 Parámetros e relacións. 9.3 Táboas de datos. Familias de obxectos.
10. LINGUAXE DO PRODUTO E LINGUAXE OBXECTUAL	10.1 Linguaxe e percepción. 10.2 Elementos da linguaxe gráfico/visual. 10.3 Linguaxe do produto. 10.4 A forma. Leis da composición. 10.5 Función simbólica. Función pragmática. 10.6 O deseño gráfico.
11. DESEÑO, INNOVACIÓN E TRANSFERENCIA	11.1 Innovación e competitividade. 11.2 Estratexias competitivas. 11.3 A transferencia tecnolóxica. As IEBT. Spin off.
12. A XESTIÓN DO DESEÑO NA EMPRESA	12.1 O deseño na empresa. 12.2 Estratexias innovadoras. Novos desenvolvementos. 12.3 O deseño na organigrama da empresa. 12.4 Manual de xestión do deseño na empresa.

13. DOCUMENTACIÓN DOS DESEÑOS	13.1 Contidos da Memoria Descritiva. 13.2 Outros documentos. 13.3 Elementos normalizados. 13.4 Listas de pezas. 13.5 Información en soporte dixital (2D e 3D).
PRÁCTICAS. Desenvolvemento dun produto novidoso por etapas, con entregas sucesivas e a final. Entrenamento das ferramentas para o deseño.	1. PANORÁMICA ACTUAL: FERRAMENTAS. 2. SESIÓNS CREATIVAS. 3. ELECCIÓN DO PRODUTO A DESENVOLVER. 4. ELABORACIÓN DAS ESPECIFICACIÓNS DO PRODUTO. ANÁLISE FUNCIONAL. QFD. 5. CREACIÓN DE COMPOÑENTES E ENSAMBLAXE. ANÁLISE DA VARIABILIDADE. 6. ANIMACIÓN. SIMULACIÓNS. 7. AVALIACIÓN E SELECCIÓN DE OPCIÓNS. 8. PRESENTACIÓN DO PRODUTO. 9. DOCUMENTACIÓN E ENTREGA FINAL.

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	26	39	65
Prácticas con apoio das TIC	24	36	60
Seminario	3	1	4
Traballo tutelado	1	15	16
Resolución de problemas e/ou exercicios	1	0	1
Informe de prácticas, prácticum e prácticas externas	1	0	1
Traballo	1	2	3

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

Metodoloxía docente

	Description
Lección maxistral	Sesión maxistral con participación activa dos estudantes. Cada unidade temática será presentada polo profesor empregando os recursos audiovisuais apropiados e complementada cos comentarios e aportacións que os estudantes realicen en base á bibliografía recomendada ou ás ideas novas que poidan xurdir. Durante as clases maxistrais proporanse exercicios a resolver parcial ou totalmente, de maneira individual ou grupal, orientados a facilitar a mellor comprensión dos contidos e métodos para o seu aproveitamento na práctica do deseño.
Prácticas con apoio das TIC	Realizarase un traballo práctico (TrP) consistente no desenvolvemento dun produto ao longo do curso, que require de horas na casa ademais do apoio das sesións creativas en grupo e das titorías. O nivel de dificultade depende da elección do alumno en función da súa dispoñibilidade e ambición. Efectuaranse diversas entregas parciais e finalmente a documentación completa do produto. O traballo orientarase a creación dun produto novedoso, valorando o nivel creativo acadado. Todo o proceso estará coordinado polo profesor desde a elección inicial do traballo a realizar.
Seminario	Realización de actividades de reforzo mediante a resolución tutelada de maneira grupal ou individual de supostos prácticos vinculados á problemática en calquera das etapas no desenvolvemento do produto. Durante os cales poderá valoraser a actitude e capacidade do alumnado para participar e achegar en cada fase do proceso
Traballo tutelado	Tanto o traballo principal como cada unha das súas fases transcorrerán en contacto permanente entre os membros de cada grupo e a coordinación do profesor.

Atención personalizada

Methodologies	Description
Traballo tutelado	ATENCIÓN PERSOALIZADA - PLAN DE CONTINXENCIAS ---------- Para todas as modalidades de docencia contempladas no Plan de Continxencias, as sesións de titorización poderán realizarse por medios telemáticos (correo electrónico, videoconferencia, foros de FAITIC, sala virtual de profesor, etc.) baixo a modalidade de concertación previa do lugar virtual, data e hora.
Tests	**Description**
Traballo	No caso de curso presencial normal, o alumno disporá de atención personalizada cando o requira, tanto no modo presencial como mediante teléfono, e-mail ou a través de foros compartidos (FAITIC, onde ademais se ubicará o temario, enunciados e demais información en formato electrónico).

Avaliación

	Description	Qualification	Evaluated Competencess
Lección maxistral	Presentación do tema por parte do profesor. Intervención e participación activa dos estudantes.	0	CG1
Prácticas con apoio das TIC	Aspectos concretos do traballo. Creación e manipulación de modelos. Análise, síntese, avaliación e simulación	0	CT2 CT8 CT9 CT10 CT14 CT17
Traballo tutelado	Traballo a realizar durante o curso, individual ou en grupo, sobre o deseño e desenvolvemento dun produto	0	CT2 CT5 CT8 CT9 CT10 CT14 CT17
Resolución de problemas e/ou exercicios	(T) Exame tipo test sobre do temario impartido ao longo do curso (40%). (TrT) Traballo teórico sobre dalgún tema curto ou aspecto concreto, a redactar e presentar (10%).	50	CG1 CT2 CT9
Informe de prácticas, prácticum e prácticas externas	(P) Informes de prácticas e partes do traballo entregarán, revisarán e avaliarán periódicamente	15	CT10 CT17
Traballo	(TrP) Traballo sobre o desenvolvemento dun produto, a desenvolver durante as sesión prácticas con apoio das titorías.	35	CT5 CT8 CT9 CT17

Other comments on the Evaluation

Cada parte cualificarase sobre 10. O aprobado por curso lógrase ao superar todas as partes. En caso de non superar algunha, gárdanse as partes aprobadas para a segunda convocatoria. Na vía do exame final, de teoría e práctica, para quen non superen a avaliación continua, cualificarase sobre 8 puntos.

Obtense a cualificación final por curso (CT) do modo seguinte:

CT = T*0,4+TrT*0,10+P*0,15+TrP*0,35

T=Exame de teoría, preguntas obxectivas curtas, TrT=Informes/memorias/exposicións ou traballos curtos presentados na clase, P=Entregas prácticas periódicas, TrP=Traballo/proxecto de desenvolvemento dun produto a entregar ao final do curso.

O aprobado por curso, pola vía de avaliación continua, acádase obtendo unha cualificación total (CT) igual ou superior a 5 puntos, de acordo coa fórmula anterior, sempre que en cada parte se acade polo menos o 40% da súa respectiva valoración máxima.

As partes superadas (nota>=5) conservaranse ata a convocatoria do mes de xullo.

Na data sinalada polo centro realizarase o exame final para quen non seguisen o sistema de avaliación continua, que comprenderá tanto á parte teórica (50%) como á práctica (50%). A cualificación obtida será a nota do curso, neste caso.

Espérase que o alumno presente un comportamento ético axeitado. No caso de detectar un comportamento non ético (copia, plaxio, utilización de aparatos electrónicos non autorizados, e outros) considerarase que o alumno non reúne os requisitos necesarios para superar a materia. Neste caso a cualificación global no presente curso académico será de suspenso (0.0).

Bibliografía. Fontes de información

Basic Bibliography

Boothroyd, G., et al., **Product Design for Manufacture and Assembly**, 0-8247-0584-x, 3ª, CRC Press, 2011

De Bono; E, **El Pensamiento creativo : el poder del pensamiento lateral para la creación de nuevas ideas**, 84-493-0069-X, Paidós, 1999

Ulrich K.T; Eppinger S.D, **Diseño y desarrollo de productos**, 978-607-15-0944-4, 5ª, MacGraw_Hill Interamericana, 2013

Complementary Bibliography

De Fusco, R., **Historia del diseño**, 84-934626-2-4, Santa & Cole, 2005

Farrer Velázquez, F.; et al., **Manual de ergonomía**, 84-7100-933-1, 2ª, Mapfre DL, 1997
Gómez, S., **El Gran Libro de SolidWorks Office Professional**, 978-84-267-2173-0, 2ª, Marcombo, 2014
Iváñez, J.M., **La gestión del diseño en la empresa**, 84-481-2836-2, McGraw-Hill, 2000
Lawrence, K.L., **Ansys Worbench tutorial: structural & thermal analysis using Release 12.1**, 978-1-58503-580-9, Schroff, 2010
Mondelo, P.R; et al., **Ergonomía**, 84-8301-318-5, UPC, 2001
Osborn, A. F., **Imaginación aplicada : principios y procedimientos para pensar creando**, M. 1320-1960, 1ª-revisada, Velflex, 1960
Rehg, J.A & Kraebber, H.W., **Computer-integrated manufactuting**, 0-13-087553-8, Pearson Prentice Hall, 2004
Sanz, F., Lafargue, J., **Diseño Industrial. Desarrollo del producto**, 84-9732-076-x, Thomson (Ed. Paraninfo), 2002
Tassinari, R., **El producto adecuado**, 84-267-0951-6, Marcombo, 1992
Zaïdi, A., **QFD. Despliegue de la función de calidad**, 84-7978-060-6, Díaz de Santos, 1993

Recomendacións

Subjects that continue the syllabus

Traballo de Fin de Grao/V12G380V01991

Subjects that it is recommended to have taken before

Expresión gráfica: Expresión gráfica/V12G380V01101
Enxeñaría gráfica/V12G380V01602
Deseño e comunicación de produto e automatización de elementos en planta/V12G380V01931

Other comments

Para matricularse nesta materia é necesario ter superado ou ben estar matriculado de todas as materias dos cursos inferiores ao curso no que está emprazada esta materia. De xeito moi especial, recomendase ter superadas previamente as tres materias sinaladas no apartado anterior.

Plan de Continxencias

Description

Dada a incerteza na evolución da alerta sanitaria provocada polo COVID-19, a Universidade establece unha planificación extraordinaria que se activará no intre en que as administracións e a propia institución o determinen, en función de criterios de seguridade, saúde e responsabilidade, para garantir o ensino nun marco non presencial ou parcialmente presencial. A previsión destas medidas garante, no intre requirido, o desenvolvemento da docencia dun xeito máis áxil e eficaz, posto que son coñecidas con anterioridade por estudantes e profesores a través da ferramenta DOCNET
De acordo coas instrucións recibidas da Vicerreitoría de Ordenación Académica e Docencia, deben contemplarse os tres escenarios enumerados a continuación, cos seus correspondentes niveis de continxencia:

ESCENARIO 1. Modalidade Presencial.
Toda a docencia desenvolverase de xeito presencial, tanto para clases teóricas como prácticas, da forma habitual contemplada na presente guía docente, similar aos cursos precedentes.

ESCENARIO 2. Modalidade Semipresencial
No caso da activación por parte das autoridades universitarias desta modalidade de ensino mixto, tal circunstancia suporía unha redución da capacidade dos espazos habitualmente empregados para o ensino na modalidade presencial, para o cal como primeira medida o centro comunicará aos profesores da materia a información relativa á nova capacidade autorizada para os espazos de ensino, de xeito que se poida proceder á reorganización das actividades formativas durante o resto do prazo. Cómpre sinalar que a reorganización a realizar dependerá do intre (durante o semestre) no que se active a devandita modalidade de ensino. A reorganización das ensinanzas efectuarase de acordo coa seguinte guía:
a) Comunicación. Informarase a todos os estudantes da materia a través da plataforma FAITIC ou dos medios oportunos das condicións específicas nas que se levarán a cabo as actividades formativas e as restantes probas de avaliación ata rematar o semestre.
b) Adaptación das titorías e atención persoalizada. As sesións de titoría poderán realizarse por medios telemáticos (correo electrónico, videoconferencia, salas virtuais, foros FAITIC, etc.), previa concertación de data e hora, nas oficinas virtuais dos profesores.
c) Actividades presenciais e non presenciais. Das restantes actividades para rematar o semestre, indicaranse aquelas actividades formativas que poden realizar todos os estudantes de xeito presencial (priorizando na medida do posible as actividades prácticas) e as actividades de formación que se realizarán de xeito remoto (as clases teóricas son a miúdo as que menos reducen a súa eficiencia con esta modalidade), co propósito de planificar a súa realización efectiva.
d) Contidos e obxectivos de aprendizaxe. Os contidos e os obxectivos de aprendizaxe non serán modificados como consecuencia deste modo de ensino.
e) Programación do ensino. Mantéñense os horarios e o calendario das clases e das diferentes actividades da materia.

f) Bibliografía ou material adicional para facilitar a autoaprendizaxe. O profesorado proporcionará aos estudantes o material didáctico necesario para satisfacer as necesidades de apoio dos estudantes para a materia, segundo as circunstancias existentes en cada momento, a través da plataforma FAITIC.
g) Avaliación. De ser preciso o modo non presencial efectuaranse as probas equivalentes aos exames presenciais mediante a plataforma Moodle.

En canto ás ferramentas a empregar nas actividades formativas a desenvolver en modo non presencial, empregaranse as plataformas de Campus Remoto e FAITIC, que se poden complementar con outras solucións para atender necesidades específicas que xurdan ao longo do período.

ESCENARIO 3. Modalidade Non Presencial
No caso de que se active a modalidade de docencia totalmente non presencial (suspensión de todas as actividades de formación e avaliación presenciais), serán prioritarias as plataformas dispoñibles na Universidade de Vigo: Campus Remoto e FAITIC. As condicións da reorganización a realizar dependerán do momento ao longo do semestre no que se active a devandita modalidade docente. Tal reorganización das ensinanzas efectuarase de cordo coa seguinte guía:
a) Comunicación. Informarase aos estudantes a través da plataforma FAITIC ou dos medios dispoñibles das condicións específicas nas que se levarán a cabo as actividades de formación e as restantes probas de avaliación para rematar o semestre.
b) Adaptación e/ou modificación de metodoloxías de ensino. A pesar de que as metodoloxías de ensino están fundamentalmente concibidas para a modalidade de docencia presencial, considérase que esencialmente conservan a súa eficiencia nesta modalidade, polo que se propón o seu mantemento prestando especial atención ó seu correcto desenvolvemento.
c) Adaptación das titorías e atención persoalizada. As sesións de titorías realizaranse por medios telemáticos (correo electrónico, videoconferencia, foros de FAITIC, salas virtuais de profesores, etc.). No caso das salas virtuais é necesaria a concertación previa da data e hora.
d) Contidos a impartir e obxectivos de aprendizaxe. Salvo indicación contraria, non se modificarán os contidos a impartir nin os obxectivos de aprendizaxe como consecuencia desta modalidade docente.
e) Programación da docencia. Mantéñense os horarios das clases e os calendarios das diferentes actividades.
f) Avaliación. Non se modifica o número de probas nin as respectivas porcentaxes de puntuación nin as datas de realización das mesmas. Tales probas realizaranse empregando Faitic e Moodle.
g) Bibliografía e material adicional para facilitar a auto-aprendizaxe. O profesorado facilitará aos alumnos o material didáctico necesario para atender as necesidades de apoio aos estudantes na materia, segundo as circunstancias que concorran.

IDENTIFYING DATA				
Advanced manufacturing technologies				
Subject	Advanced manufacturing technologies			
Code	V12G380V01935			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	Spanish			
Department				
Coordinator	Pereira Domínguez, Alejandro			
Lecturers	Pereira Domínguez, Alejandro Pérez García, José Antonio			
E-mail	apereira@uvigo.es			
Web				
General description	Subject of the degree of mechanics of the speciality of design and manufacture. It treats to apply the methodology of learning based in project (*PBL), consistent in the proposition of projects to make by groups, in the workshops from the phase of *conceptualización to the phase of manufacture, setting, verification and adjust.			

Competencies	
Code	
CG1	CG1 Skills for writing, signing and developing projects in the field of industrial engineering, whose purpose, specializing in Mechanics, construction, alteration, repair, maintenance, demolition, manufacturing, installation, assembly or operation of: structures, mechanical equipments, energy facilities, electrical systems and electronic installations and industrial plants, and manufacturing processes and automation.
CG5	CG5 Knowledge to carry out measurements, calculations, assessments, appraisals, surveys, studies, reports, work plans and other similar works.
CE15	CE15 Basic knowledge of production systems and manufacturing.
CE26	CE26 Applied knowledge of systems and manufacturing processes, metrology and quality control.
CT8	CT8 Decision making.
CT9	CT9 Apply knowledge.
CT17	CT17 Working as a team.
CT20	CT20 Ability to communicate with people not expert in the field.

Learning outcomes		
Learning outcomes	Competences	
Capacity to resolve problems of manufacture in industrial surroundings	CE26	
Knowledges *basicos of systems of production and manufacture	CE15	
Capacity of editorial and writing of documents	CG1	
Capacity of learning		CT8
Capacity of calculation and measurements	CG5	
Analysis and synthesis of approach of improvements and resolution of problems		CT9
Oral communication and written by means of the exhibition of works and *realzacions of memories		CT20
Application and utilisation of computer tools	CG5	
Taking of decisions		CT8
Application of the knowledges *aquiridos		CT9
Realisation of changes and experimentation in process	CG5	
The work in team values in groups of 3 to 5 people.		CT17
Exhibition of works		CT20

Contents	
Topic	
Mechanised of High Speed.	Considerations and parametrisation of the Half process and tools used Simulation of process. Application
Processes of *moldeo of polymeric materials and *composites.	Parametrisation of processes of conformed. Analysis Process injection Conformed *composites Project of manufacture of mould

Technicians Advanced of Measurement and Control of Quality. Technical *CAQ	□ Systems of measurement with contact □ Systems of measurement without contact □ *Aseguramiento of dimensional tolerances, geometrical, of form and superficial □ Finished position and *Texturizado
Programming and control of cells of manufacture.	□ *Programacion CAM of CM □ *Programacion CAM of lathe □ *Programacion CAM of Robot □ Simulation and *Programacion Cell
Technologies for the *micro and the *nanofabricación.	□ Means and toolings of *Microfabricación □ Technologies of *nanofabricación

Planning

	Class hours	Hours outside the classroom	Total hours
Workshops	26	0	26
Workshops	0	96	96
Problem solving	14	0	14
Presentation	4	0	4
Lecturing	10	0	10

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

Methodologies

	Description
Workshops	Preparation of project of manufacture, memory and practical design
Workshops	*Guia Of tools used in function of the existent resources
Problem solving	Application of problems of calculation of manufacture
Presentation	Presentation by heart and project designed and manufactured
Lecturing	Exhibition of theory and application to practical cases

Personalized assistance

Methodologies	Description
Workshops	The project of course distributes in groups, of 3 to 5 people. *Consisitirá In: Preparation of design detailed *Realización of planning of processes Programming of manufacture Execution of manufacture (According to means and available budgets)

Assessment

	Description	Qualification	Evaluated Competencess	
Workshops	Development of design of product and process. The STUDENT takes into account Difficulty level of design TRL of innovation Planificacion process planning Programming CAM Difficulty level of manufacture Execution Memory document	60	CE15 CE26	CT8 CT9 CT17 CT20
Presentation	The students have to present the PBL project based learning process	40	CG1 CG5	

Other comments on the Evaluation

Sources of information

Basic Bibliography

Complementary Bibliography

Pereira Domínguez, Alejandro, **Apuntes de la asignatura**, v4 2016,

Kalpakjian, S.; Steven R. S., **Manufacturing Engineering and Technology**, 7ª ed.,,

Groover, M. P., **Principles of modern manufacturing**, 5ªed,

Recommendations

Subjects that it is recommended to have taken before

Contingency plan

Description

=== EXCEPTIONAL MEASURES PLANNED ===
Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes extraordinary planning that will be activated at the time that the administrations and the institution itself determine it based on safety, health and responsibility criteria. , and guaranteeing teaching in a non-classroom or partially classroom setting. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way by being known in advance (or well in advance) by students and teachers through the standardized tool and institutionalized teaching guides.

=== ADAPTATION OF THE METHODOLOGIES ===
* Teaching methodologies that are maintained
All. With the exception of the realization that will be carried out remotely
* Non-face-to-face service mechanism for students (tutorials)
Through virtual dispatch on remote and virtual campus
* Additional bibliography to facilitate self-learning
Documents or links to necessary educational resources will be published in faitic
=== ADAPTATION OF THE EVALUATION ===
* Tests already carried out
They are all kept with the same weight and value

* Pending tests that are maintained
They will be carried out electronically through faitic keeping the same weight and value

IDENTIFYING DATA				
Automóbiles e ferrocarrís				
Subject	Automóbiles e ferrocarrís			
Code	V12G380V01941			
Study programme	Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	4	1c
Teaching language	Castelán Galego			
Department	Enxeñaría mecánica, máquinas e motores térmicos e fluídos			
Coordinator	Izquierdo Belmonte, Pablo			
Lecturers	Izquierdo Belmonte, Pablo			
E-mail	pabloizquierdob@uvigo.es			
Web	http://moovi			
General description	Coñecementos sobre vehículos automóbiles e vehículos ferroviarios: descrición dos seus elementos e dinámica vehicular			

Competencias	
Code	
CG3	CG3 Coñecemento en materias básicas e tecnolóxicas que os capacite para a aprendizaxe de novos métodos e teorías, e os dote de versatilidade para adaptarse a novas situacións.
CG4	CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial na especialidade de Mecánica.
CE13	CE13 Coñecemento dos principios de teoría de máquinas e mecanismos.
CE20	CE20 Coñecementos e capacidades para o cálculo, deseño e ensaio de máquinas.
CT3	CT3 Comunicación oral e escrita de coñecementos.
CT6	CT6 Aplicación da informática no ámbito de estudo.
CT10	CT10 Aprendizaxe e traballo autónomos.
CT16	CT16 Razoamento crítico.
CT17	CT17 Traballo en equipo.
CT20	CT20 Capacidade para comunicarse con persoas non expertas na materia.

Resultados de aprendizaxe		
Learning outcomes	Competences	
Comprender o funcionamento dos sistemas principais do automóbil e do ferrocarril	CG3 CG4	CT10 CT16
Habilidade para realizar cálculos de dinámica *vehicular	CE13 CE20	CT6 CT10 CT16
Capacidade para deseñar sistemas e compoñentes do automóbil e do ferrocarril		CT3 CT6 CT10 CT16 CT17 CT20

Contidos	
Topic	
Introdución á teoría dos vehículos automóbiles.	- O vehículo automóbil, concepto. - Principais requerimientos do vehículo automóbil. - O sistema home-máquina-medio. - Obxectivos e alcance de a teoría dos vehículos automóbiles
Interacción entre o vehículo e a superficie de rodadura	- Características xerais e mecánicas do neumático, características mecánicas. - Estudo de esforzos lonxitudinais (tracción, freado) e trasversales (deriva). - Modelos matemáticos suelo-roda
Aerodinámica dos automóbiles	- Accións aerodinámicas sobre os sólidos, conceptos xerais - Accións aerodinámicas sobre o vehículo automóbil.
Dinámica lonxitudinal. Prestaciones	- Dinámica lonxitudinal: Resistencia ó movemento. Ecuación fundamental do movemento lonxitudinal - Prestacións: estimación de prestacións do vehículo - Esforzo tractor máximo e limitación pola adherencia.

Freado de vehículos automóbiles	- Forzas e momentos que actúan no proceso de freado. - Condicións impostas pola adherencia para freado óptimo. - Sistema de freado e proceso de freado. - El sistema ABS
O sistema de transmisión	- Características do motor e transmisión. - Principios de deseño do sistema de transmisión e dos seus elementos
Dinámica lateral do vehículo	- Análise do comportamento transversal do vehículo e do sistema de dirección - Geometría da dirección. - Maniobrabilidade a baixa velocidade. - Velocidade límite de derrape e volco. - Comportamento direccional do vehículo en réxime estacionario.
O sistema de suspensión	- Análise do comportamento vertical do vehículo e do sistema de suspensión. - As vibracións sobre o vehículo, acción sobre o ser humano. - O sistema de suspensión: modelo matemático. - Cinemática da suspensión. - Sistemas de suspensión: elementos elásticos e de absorción. - Influencia da suspensión no comportamento do vehículo. - Reglaxes da suspensión.
Sistemas de seguridade no automóbil	- Seguridade activa e pasiva. - Sistemas de axuda á condución: control de tracción e estabilidade, ABS. - Influencia de a técnica de condución. - A seguridade pasiva: estruturas deformables, célula de seguridade, cintos de seguridade, airbag. - Análise da infraestructura viaria: Influencia da infraestructura viaria no comportamento dinámico do vehículo - Reformas de importancia en vehículos automóbiles: Normativa e execución de reformas
Ferrocarrís	- Infraestrutura - Sistemas do vehículos ferroviarios: tracción, suspensión, etc. - Elementos rodantes

Planificación			
	Class hours	Hours outside the classroom	Total hours
Lección maxistral	15	32	47
Resolución de problemas	15	30	45
Prácticas de laboratorio	5	6	11
Prácticas con apoio das TIC	12	12	24
Exame de preguntas de desenvolvemento	3	0	3
Traballo	0	20	20
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente	
	Description
Lección maxistral	Exposición dos temas con apoio multimedia
Resolución de problemas	Resolución de problemas dos diferentes contidos
Prácticas de laboratorio	Análise de elementos de reais do automóbil
Prácticas con apoio das TIC	Cálculos e simulacións do comportamento vehicular

Atención personalizada	
Methodologies	**Description**
Resolución de problemas	Resolución de dúbidas durante a sesión. Supervisión do profesor na aula con atención a demanda para aclaración de contidos. Tutorías personalizadas para aclaración de dúbidas na resolución de exercicios.
Prácticas de laboratorio	Revisión posto a posto
Prácticas con apoio das TIC	Revisión posto a posto

Lección maxistral	Resolución de dúbidas durante a sesión. Tutorías personalizadas para aclaración de dúbidas nos contidos impartidos.

Avaliación

	Description	Qualification	Evaluated Competencess		
Exame de preguntas de desenvolvemento	Proba escrita, teoría e problemas	60	CG3 CG4	CE13 CE20	CT3 CT6 CT10 CT16 CT17 CT20
Traballo	O traballo contempla tanto as partes de traballo autónomo, individual ou *grupal, como probas relativas ao desenvolvemento de devanditos traballos, en concreto: - Asistencia con aproveitamento ás prácticas e elaboración de informes das prácticas realizadas e realización das probas relativas á sesión práctica (laboratorio ou aula de informática) - Realización de actividades e cuestionarios visuais descritivos, e entrega e revisión dos mesmos	40	CG3 CG4	CE13 CE20	CT3 CT6 CT10 CT16 CT17 CT20

Other comments on the Evaluation

- A cualificación da avaliación continua terá un peso do 40% (4 puntos sobre 10) na nota final da materia, e divídese en dous partes:

Por unha banda, a realización das actividades e prácticas □*P□, incluíndo entregas/test asociados, correspóndese a un 15% (5+5+5) da cualificación final (1,5 puntos sobre 10), incluíndo a participación nas actividades publicadas en *Faitic previamente e para a sesión, e entrégalas/test solicitadas. Para poder considerar a parte *P na cualificación final, débense de realizar todas as actividades descritas.

Por outra banda, a realización de cuestionarios □*Q□ descritivos, segundo as instrucións dadas, incluíndo a participación nas actividades publicadas en *Faitic sobre os sistemas de vehículos automóbiles, e, así mesmo, a realización e revisión dos restantes cuestionarios □*Q□ expostos polos demais grupos, correspóndese a un 25% (5+5+15) da cualificación final (2,5 puntos sobre 10). Dentro desta porcentaxe inclúese a realización dunha proba individual de avaliación continua sobre devanditos cuestionarios *Q, a realizar o mesmo día que o exame final. As cuestións non serán necesariamente de tipo test, senón tamén poden ser de resposta curta, e non necesariamente iguais ás desenvolvidas previamente, senón da mesma tipoloxía. Para poder considerar a parte *Q na cualificación final, débense realizar todas as actividades descritas, incluída a proba individual de avaliación continua correspondente.

- O alumnado con RENUNCIA a cualificación continua, DEBE CONTACTAR CO PROFESORADO para indicar que desexa realizar unha proba que supla a non realización das actividades □*P□ e □*Q□, de tal modo que dita parte póidaselle cualificar cunha proba específica que terá lugar na mesma data que o exame final. Esta proba específica abarcará os contidos relativos ás actividades e prácticas □*P□ e as súas entregas/test asociados e aos cuestionarios □*Q□ descritivos (sobre un total de 4 puntos: 1,5+2,5 puntos).

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- A cualificación do exame final terá un peso correspondente ao restante 60% (6 puntos sobre 10) na nota final da materia, e poderá ter diversas tipoloxías de actividades de avaliación:

Actividades correspondentes á parte de
CÁLCULO, que será aproximadamente un 75%-85% do exame (4-5 puntos sobre 6,
aproximadamente), e actividades correspondentes á parte DESCRITIVA, que
será aproximadamente o restante 15%-25% do exame (1-2 puntos sobre 6, aproximadamente).

Para considerar ditas actividades
correcta, os cálculos realizados deberán estar claramente xustificados e requirirase exactitude na solución e coherencia na formulación. Así mesmo,
as actividades serán exercicios e/ou cuestións, e estas últimas non serán
necesariamente de tipo test, senón tamén poden ser de explicación breve ou resposta
curta.

A parte de CÁLCULO abarca todos os
contidos relativos ao vehículo e o seu comportamento. A parte DESCRITIVA
abarca non só os contidos de sistemas de vehículos automóbiles (*T1 a *T4)
senón tamén os contidos correspondentes aos temas *T5 de seguridade,
homologación-inspección-reformas, infraestruturas,□ e *T6 de vehículos
ferroviarios e material *rodante.

&*nbsp;

&*nbsp;

No exame final esíxese unha puntuación
mínima de 2,5 puntos sobre 6 para que se poida ter en conta a parte de cualificación
da avaliación continua. En caso de non alcanzarse devandito valor, a
cualificación final será a correspondente unicamente ao exame, sen considerar
a parte de avaliación continua, que se conservará para a segunda edición.

No caso de alcanzar dita puntuación
mínima no exame, a cualificación final será a suma da cualificación do
exame (sobre 6 puntos) e a cualificación das dúas partes, □*P□ e □*Q□, da
avaliación continua (sobre 4 puntos), sendo necesario alcanzar un 5,0 para
superar a materia.

&*nbsp;

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Empregarase un sistema de cualificación
numérica de 0 a 10 puntos cun decimal.

* Compromiso ético: espérase que o
alumno presente un comportamento ético adecuado (é coñecedor de devandito
compromiso, tanto da Escola, como do publicado pola Universidade). No
caso de detectar un comportamento non ético (copia, plaxio, utilización de medios,
incluídos aparellos electrónicos, non autorizados, e outros) considerarase que o
alumno non reúne os requisitos necesarios para superar a materia. Neste caso
a cualificación global no presente curso académico será de suspenso (0,0).

Bibliografía. Fontes de información

Basic Bibliography

Casqueiro, Carlos, **Apuntes de teoría de Automoviles**, 2011

Pablo Luque, **Ingeniería del automóvil : sistemas y comportamiento dinámico**, Thomson, 2004

Manuel Arias-Paz, **Manual de Automóviles**, Dossat, 2001

Complementary Bibliography

Cascajosa Soriano, Manuel, **Ingeniería de vehículos : sistemas y cálculos**, Tébar, 2007

José Font Mezquita, **Tratado sobre automóviles**, UPV, 2006

Recomendacións

Subjects that it is recommended to have taken before

Teoría de máquinas e mecanismos/V12G380V01306
Deseño de máquinas I/V12G380V01304

Plan de Continxencias

Description

As metodoloxías docentes se impartirán, de ser necesario, adecuándoas ós medios telemáticos que se poñan a disposición do profesorado, ademais da documentación facilitada por FAITIC e outras plataformas, correo electrónico, etc.
Na medida do posible, primarase a impartición dos contidos teóricos por medios telemáticos así como aqueles contidos de prácticas de problemas, aula de informática, e outros, que sexa posible ser virtualizados, ou impartidos en aulas máis amplas para cumprir coa normativa de ocupación e distnaciamento en vigor, intentado mater a presencialidade para as prácticas experimentáis de laboratorio, con grupos reducidos. No caso de non poder ser impartida de forma presencial, aqueles contidos nos virtualizables se impartirán ou suplirán por outros (traballo autónomo guíado, etc.) que permitan acadar igualmente ás competencais asociados a eles.

As titorías desenvolveranse indistintamente de forma presencial (sempre que sexa posible e garantir as medidas sanitarias) e telemáticas (email e outros) respetando os horarios de titorias previstos. Asemade, farase unha adecuación metodolóxica ó alumnado de risco, facilitándlle información específica adicional, de acreditarse que non pode ter acceso ós contidos impartidos de forma convencional.

Información adicional sobre a avaliación: manteñense aquelas probas que xa se veñen realizando de forma telemática e, na medida do posible, manteranse as probas presenciais adecuándoas a normativa santaria vixente. As probas se desenvolverán de forma presencial salvo Resolución Reitoral que indique que se deben facer de forma non presencial, realizándose dese xeito a través das distintas ferramentas postas a disposición do profesorado. Aquelas probas non realizables de forma telemática se suplirán por outros (entregas de traballo autónomo guíado, etc.)
- Indicar, neste ultimo caso, de ser necesraio, os novos pesos da avaliación. Se non se cambian os pesos de avaliación, indicalo:
Mantéñense os criterio de avaliación adecuando a realización das probas, no caso de ser necesario e por indicación en Resolución Reitoral, ós medios telemáticos postos a disposición do profesorado

IDENTIFYING DATA				
Sistemas fluidomecánicos e materiais avanzados para o transporte				
Subject	Sistemas fluidomecánicos e materiais avanzados para o transporte			
Code	V12G380V01942			
Study programme	Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	12	Optional	4	1c
Teaching language	Castelán			
Department	Enxeñaría dos materiais, mecánica aplicada e construción Enxeñaría mecánica, máquinas e motores térmicos e fluídos			
Coordinator	2021_22_agardap6anualvi_600 ,			
Lecturers	2021_22_agardap6anualvi_600 , Álvarez Dacosta, Pedro Paz Penín, María Concepción			
E-mail	direc.profesorado@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	Trátase dunha materia de 4º Curso da *Intensificación de Transporte en Enxeñaría Mecánica. A materia estrutúrase en dous partes ben diferenciadas: Bloque *I: Sistemas *fluidomecánicos para o transporte, dedicado ao estudo dos fluxos de interese na industria do automóbil e nos restantes medios de transporte. Bloque *II: Materiais avanzados para o transporte, cuxo obxectivo é que o alumno coñeza os diversos materiais que se aplican ao deseño, funcionamento de vehículos para transporte terrestre, marítimo e aéreo. Ambos os bloques impartiranse simultaneamente e de forma independente ao longo do primeiro cuadrimestre. Dada a especificidade de cada unha das partes consideradas, as metodoloxías docentes adaptaranse a cada unha delas. Así mesmo, o sistema de avaliación mantense claramente diferenciado, para adecuarse mellor ás características de cada parte da materia.			

Competencias	
Code	
CG4	CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial na especialidade de Mecánica.
CG6	CG6 Capacidade para o manexo de especificacións, regulamentos e normas de obrigado cumprimento.
CG7	CG7 Capacidade para analizar e valorar o impacto social e ambiental das solucións técnicas.
CG8	CG8 Capacidade para aplicar os principios e métodos da calidade.
CE24	CE24 Coñecemento aplicado dos fundamentos dos sistemas e máquinas fluidomecánicas.
CE25	CE25 Coñecementos e capacidades para a aplicación da enxeñaría de materiais.
CT10	CT10 Aprendizaxe e traballo autónomos.
CT17	CT17 Traballo en equipo.

Resultados de aprendizaxe	
Learning outcomes	Competences

- Coñecemento de fluxos complexos e a súa aplicación no deseño e funcionamento de vehículos para transporte terrestre, marítimo e aéreo. - Capacidade para o deseño das distintas instalacións de fluídos dos principais compoñentes dos vehículos para transporte terrestre, marítimo e aéreo.. - Capacidade para o deseño das distintas instalacións de fluídos da industria do transporte e industrias afíns	CG4 CG6 CG7 CG8	CE24 CE25	CT10 CT17

 Coñece os requirimentos básicos da industria do transporte e industrias afíns para a realización dunha selección adecuada de materiais.
 Coñece a evolución dos distintos tipos de materiais que se empregan nas principais compoñentes dos vehículos para transporte terrestre, marítimo e aéreo e dos procesos para a súa posible conformación.
 Coñece os distintos tipos de materiais.
 Selecciona os materiais máis adecuados para as distintas aplicacións dentro da industria do transporte e industrias afíns
 Coñece os novos materiais empregados nesta industria.
 Aplica os coñecementos adquiridos sobre o comportamento dos materiais para utilizar con éxito as tecnoloxías de conformado, unión e acabado nos distintos compoñentes do transporte terrestre, marítimo e aéreo.
 Entende as especificacións de compra de materiais.
 Identifica de modo eficaz as causas de fallo en servizo derivadas do material empregado.
 Coñece a tecnoloxía da reciclaxe dos materiais empregados na industria do transporte.
 Analiza e propón solucións operativas a problemas no ámbito da enxeñaría de materiais.
 Redacta textos coa estrutura adecuada aos obxectivos de comunicación. Presenta o texto a un público coas estratexias e os medios adecuados
 Demostra capacidades de comunicación e traballo en equipo.
 Identifica as propias necesidades de información e utiliza os medios, espazos e servizos dispoñibles para deseñar e executar procuras adecuadas ao ámbito temático.
 Leva a termo os traballos encomendados a partir das orientacións básicas dadas polo profesor, decidindo a duración das partes, incluíndo achegas persoais e ampliando fontes de información.

Contidos

Topic	
BLOQUE *I: SISTEMAS *FLUIDOMECANICOS PARA O TRANSPORTE	1. FLUXOS EXTERNOS. FORZAS SOBRE CORPOS NO SEO DUN FLUÍDO. RESISTENCIA. *SUSTENTACION. 2. FLUXOS *COMPRESIBLES. OPERACIÓN DE *TOBERAS CONVERXENTES E DIVERXENTES. FLUXO EN CONDUTOS SEN FRICCIÓN E CON ADICIÓN DE CALOR. 3. FLUXOS *TURBULENTOS. TURBULENCIA. MODELOS *TURBULENTOS. 4. FLUXO *LAMINAR. *LUBRICACION. 5. *ELECTRONEUMATICA. *HIDRAULICA. 6. *FORMACION DE CONTAMINANTES. DISPOSITIVOS *ANTICONTAMINACION. 7. *TURBOMAQUINAS COMPOSTAS.
BLOQUE *II: MATERIAIS AVANZADOS NA INDUSTRIA DO TRANSPORTE	1.- REQUIRIMENTOS NA INDUSTRIA DO TRANSPORTE: Normativas. *Aligeramiendo no peso do vehículo. 2.- EVOLUCIÓN DOS MATERIAIS E As súas TECNOLOXÍAS.- Mecanismos de aumento de resistencia. Procesado. Criterios de selección de materiais: *Corrosión e protección contra *corrosión. 3.- MATERIAIS AVANZADOS NA INDUSTRIA DO AUTOMÓBIL. Materiais para carrozaría (Aceiros avanzados, aliaxes lixeiras, materiais compostos). Materiais para Sistemas mecánicos. Materiais para revestimento interior. Reciclado. 4.- MATERIAIS NOUTRAS INDUSTRIAS DE TRANSPORTE. Ferrocarril. construción naval. Industria aeronáutica 5.- ACEIROS DE FERRAMENTAS PARA CONFORMADO DE MATERIAIS.

Planificación

	Class hours	Hours outside the classroom	Total hours
Actividades introdutorias	1	0	1
Lección maxistral	40.2	81	121.2
Prácticas con apoio das TIC	7.5	7	14.5
Prácticas de laboratorio	15	15	30
Saídas de estudo	3	0	3
Lección maxistral	19	38	57
Prácticas con apoio das TIC	6	9	15

Estudo de casos	4	12	16
Saídas de estudo	4	0	4
Exame de preguntas de desenvolvemento	5	0	5
Traballo	0	15	15
Resolución de problemas e/ou exercicios	2.3	0	2.3
Informe de prácticas, prácticum e prácticas externas	0	6	6
Estudo de casos	0	10	10
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente	
	Description
Actividades introdutorias	Nesta actividade detállanse as características da materia, xustificando as peculiaridades dos dous bloques de contido. Explícanse as metodoloxías empregadas na mesma, así como o sistema de avaliación empregado. Presentación da aplicación na plataforma **FAITIC
Lección maxistral	BLOQUE *I: Explícanse os fundamentos de cada tema para posterior resolución de problemas prácticos. Poderanse realizar actividades como: Sesión maxistral Lecturas Revisión bibliográfica Resumen Esquemas Solución de problemas Conferencias Presentación oral
Prácticas con apoio das TIC	BLOQUE *I:Aplicaranse os conceptos explicados en clase mediante a utilización de equipos informáticos. Poderanse realizar: Casos prácticos Simulación Solución de problemas
Prácticas de laboratorio	BLOQUE *I:Aplicaranse os conceptos desenvolvidos de cada tema á realización de prácticas de laboratorio. Fundamentalmente, realizaranse actividades de experimentación, aínda que tamén poderán realizarse: Casos prácticos Simulación Solución de problemas Aprendizaxe *colaborativo
Saídas de estudo	BLOQUE *I: Realizaranse saídas a distintas empresas da contorna do sector de automoción.
Lección maxistral	BLOQUE **II: MATERIAIS AVANZADOS. Exposición por parte do profesor dos principais contidos de cada tema. O alumno disporá da documentación precisa para o seguimento da presentación (*FAITIC). Nestas sesións *s *emarcarán as directrices dos traballos que os alumnos deberán desenvolver posteriormente, de maneira individual o en grupo
Prácticas con apoio das TIC	BLOQUE **II: MATERIAIS AVANZADOS. Realizaranse exemplos de selección de materiais mediante prográmao informático **CesEdu-**Pack
Estudo de casos	BLOQUE **II: MATERIAIS AVANZADOS. Na aula proporase aos alumnos o estudo de casos concretos, nos que deberán realizar a procura, revisión crítica e organización da información correspondente e proposta de solucións. Traballos en grupo.
Saídas de estudo	BLOQUE **II: Realizaranse saídas as distintas empresas da contorna para coñecer os materiais empregados en distintas compoñentes de vehículos, así como os procesos de fabricación, se é posible.

Atención personalizada	
Methodologies	**Description**
Lección maxistral	O horario de *tutorías publicarase ao comezo do curso na plataforma de *teledocencia.
Prácticas con apoio das TIC	Atención personalizada e tempo reservado polo docente para atender e resolver as dúbidas do alumno
Prácticas de laboratorio	Atención personalizada e tempo reservado polo docente para atender e resolver as dúbidas do alumno
Lección maxistral	Atención personalizada e tempo reservado polo docente para atender e resolver as dúbidas do alumno
Prácticas con apoio das TIC	Atención personalizada e tempo reservado polo docente para atender e resolver as dúbidas do alumno

Saídas de estudo	Atención personalizada e tempo reservado polo docente para atender e resolver as dúbidas do alumno
Estudo de casos	Atención personalizada e tempo reservado polo docente para atender e resolver as dúbidas do alumno
Actividades introdutorias	Atención personalizada e tempo reservado polo docente para atender e resolver as dúbidas do alumno
Tests	**Description**
Traballo	Atención personalizada e tempo reservado polo docente para atender e resolver as dúbidas do alumno

Avaliación

	Description	Qualification	Evaluated Competencess		
Exame de preguntas de desenvolvemento	Avaliación bloque I: Proba escrita que avaliará os coñecementos adquiridos polo alumno ao longo da parte da materia Sistemas fluidomecánicos para o transporte. Poderá constar de:cuestións teóricas, cuestións prácticas, exercicios/problemas e/ou tema a desenvolver	44	CG4 CG6 CG7 CG8	CE24 CE25	CT10 CT17
Traballo	Avaliación bloque I: Traballo ou traballos relacionados coa avaliación continua no que o alumno aplicará os coñecementos adquiridos na parte da materia Sistemas fluidomecánicos para o transporte.	9	CG4 CG6 CG7 CG8	CE24	CT10 CT17
Resolución de problemas e/ou exercicios	Avaliación bloque ***II: Materiais Avanzados - Proba escrita que se avaliación dos coñecementos adquiridos nesta parte da materia. Incluirá cuestións de resposta curta, tipo test e de aplicación práctica.	35	CG4 CG6 CG7 CG8	CE24 CE25	CT10 CT17
Informe de prácticas, prácticum e prácticas externas	Avaliación bloque ***II: Materiais Avanzados. Valorarase o informe das visitas realizadas ás empresas se se realizan as visitas. No caso de que non se realicen, a valoración deste apartado contemplarase no traballo proposto ao alumno	4	CG7		CT10
Estudo de casos	Avaliación bloque **II: Valorarase o traballo realizado polo alumno nos traballos propostos para o seu traballo en grupo. Valorarase a capacidade de análise e ***estructuración da información recompilada, a solución proposta e a redacción do traballo. Tamén se terá en conta a exposición pública realizada.	8	CG4 CG6 CG7 CG8	CE25	CT10 CT17

Other comments on the Evaluation

Para que a materia considérese superada, polo menos o alumno deberá alcanzar un 40% da nota de cada bloque.
BLOQUE I. Para que o bloque considerese superado o alumno deberá acadar a lo menos un 40% da nota de parte avaliada neste bloque.
Segunda edición da Acta (Convocatoria de Xullo). BLOQUE I. A avaliación será continua excepto para os alumnos que renuncien a ela, nese caso haberá un exame final.
Segunda edición da Acta (Convocatoria de Xullo). SÓ BLOQUE II. Na segunda edición da acta (Convocatoria de Xullo), no Bloque II da materia non se terá en conta a nota da avaliación continua (Nota alcanzada nas diferentes actividades propostas ao alumno no período de impartición da materia). O exame que se realizará na a convocatoria de Xullo será avaliado sobre 10 puntos, que sobre a nota en global da materia correspóndelle un 3,8 sobre 10.
Compromiso ético: espérase que o alumno presente un comportamento ético adecuado. No caso de detectar un comportamento non
ético (copia, plaxio, utilización de aparellos electrónicos non autorizados, e outros) considerarase que o alumno non reúne os requisitos necesarios para superar a materia. Neste caso a cualificación global no presente curso académico será de suspenso (0.0).

Bibliografía. Fontes de información

Basic Bibliography

F. White Tr- Concepción Paz Penín, **Mecánica de Fluidos**, VI,
J. Tu, G. Yeoh, C., **Computational Fluid Dynamics: A Practical Approach**,

Complementary Bibliography

C. Mataix, **Turbomáquinas Hidráulicas**,
Fluent Inc, **Fluent User Guide**,
Yunus A. Cengel, John M. Cimbala, **Fluid Mechanics: Fundamentals and Applications**,
M. F. Asbhy, **Materials Selection in Mechanical Design**, 4th. Ed. Butterworth-Heinemann, Elsevier,
Geoff Davies, **Materials for Autombile Bodies**, Butterworth-Heinemann, Elsevier,
H-H. Braess, U. Seiffert, **Handbook of Automotive Engineering**, SAE International,

R.E. Smallman, A.H.W. Ngan, **Physical Metallurgy and Advanced Materials**, 7 th. Ed., Butterworth-Heinemann, Elsevier,
Crespo, **Mecánica de Fluidos**, Editorial Paraninfo,
Fluent User Guide,

Recomendacións

Subjects that are recommended to be taken simultaneously

Automóbiles e ferrocarrís/V12G380V01941
Sistemas motopropulsores/V12G380V01943

Subjects that it is recommended to have taken before

Ciencia e tecnoloxía dos materiais/V12G380V01301
Mecánica de fluídos/V12G380V01405
Enxeñaría de materiais/V12G380V01504
Máquinas de fluídos/V12G380V01505

Other comments

Requisitos:
Para matricularse nesta materia é necesario superar ou ben estar matriculado de todas as materias dos cursos inferiores ao curso no que está situada esta materia.

En caso de discrepancias prevalecerá a versión en castelán desta guía.

Plan de Continxencias

Description

=== MEDIDAS EXCEPCIONAIS PLANIFICADAS ===
Ante a incerta e imprevisible evolución da alerta sanitaria provocada polo *COVID-19, a Universidade de Vigo establece unha planificación extraordinaria que se activará no momento en que as administracións e a propia institución determíneno atendendo a criterios de seguridade, saúde e responsabilidade, e garantindo a docencia nun escenario non presencial ou parcialmente presencial. Estas medidas xa planificadas garanten, no momento que sexa preceptivo, o desenvolvemento da docencia dun modo máis áxil e eficaz ao ser coñecido de antemán (ou cunha ampla antelación) polo alumnado e o profesorado a través da ferramenta normalizada e institucionalizada das guías docentes.

=== ADAPTACIÓN DAS METODOLOXÍAS ===

BLOQUE *I: SISTEMAS *FLUIDOMECANICOS
* Contidos: Non se modifican os contidos.
* As metodoloxías docentes adecuaranse, de ser necesario, aos medios
*telemáticos que se poñan a disposición *do profesorado.
* Resultados de aprendizaxe: Non se modifican os resultados de aprendizaxe.
* Avaliación: Modificarase de ser necesario a modalidade das probas, que poderán pasar a ser non presenciais. Os criterios de avaliación non se modifican.
**Tutorías: Realizaranse de forma *telemática, previa cita por correo electrónico, no despacho virtual do profesor.
BLOQUE *II: MATERIAIS AVANZADOS
* Metodoloxías docentes que se manteñen: Lección maxistral e *tutorías. Estas adecuaranse aos medios *telemáticos que se poñan a disposición do profesorado

* Metodoloxías docentes que se modifican:
Prácticas en aula informáticas: Estas substituiranse por vídeos explicativos e material docente complementario para explicar os contidos de selección de materiais que se traballaban co Programa Informático *CesEdu. *PacK

* Mecanismo non presencial de atención ao alumnado (*tutorías):
Estas realizaranse de forma *telemática (e-mail, Cartafol Dubidas en *FAITIC e Despacho Virtual)

* Bibliografía adicional para facilitar o auto-aprendizaxe
Toda a que se considere necesaria facilitásese a través da plataforma docente *FAITIC

* Información adicional

=== ADAPTACIÓN DA AVALIACIÓN ===
* Probas xa realizadas

Proba *XX: [Peso anterior 00%] [Peso Proposto 00%]
...

* Probas pendentes que se manteñen
Proba *XX: [Peso anterior 00%] [Peso Proposto 00%]
...

* Probas que se modifican
[Proba anterior] => [Proba nova]

* Novas probas

* Información adicional

BLOQUE *II: MATERIAIS AVANZADOS
O profesorado da materia considera que non é necesario facer axustes nos criterios de avaliación publicados
O exame final substituirase por 2 *ó 3 probas de avaliación continua. Estas probas consistirán na realización dun cuestionario con preguntas tipo test (verdadeiro ou falso, ou elixir entre varias opcións) ou exercicios que se realizasen a través das ferramentas *FAITIC-CAMPUS REMOTO cun tempo limitado de realización.
A defensa do traballo tutelado farase de forma *telemática (Despacho Virtual)

IDENTIFYING DATA				
Sistemas motopropulsores				
Subject	Sistemas motopropulsores			
Code	V12G380V01943			
Study programme	Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	4	1c
Teaching language	Castelán			
Department	Enxeñaría mecánica, máquinas e motores térmicos e fluídos			
Coordinator	Porteiro Fresco, Jacobo Gómez Rodríguez, Miguel Ángel			
Lecturers	Gómez Rodríguez, Miguel Ángel Porteiro Fresco, Jacobo			
E-mail	porteiro@uvigo.es miguelgr@uvigo.es			
Web				
General description				

Competencias	
Code	
CG4	CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial na especialidade de Mecánica.
CG5	CG5 Coñecementos para a realización de medicións, cálculos, valoracións, taxacións, peritaxes, estudos, informes, planes de labores e outros traballos análogos.
CG6	CG6 Capacidade para o manexo de especificacións, regulamentos e normas de obrigado cumprimento.
CG7	CG7 Capacidade para analizar e valorar o impacto social e ambiental das solucións técnicas.
CG11	CG11 Coñecemento, comprensión e capacidade para aplicar a lexislación necesaria no exercicio da profesión de Enxeñeiro Técnico Industrial.
CT2	CT2 Resolución de problemas.
CT7	CT7 Capacidade para organizar e planificar.
CT9	CT9 Aplicar coñecementos.
CT10	CT10 Aprendizaxe e traballo autónomos.
CT17	CT17 Traballo en equipo.

Resultados de aprendizaxe		
Learning outcomes	Competences	
Coñecer a base tecnolóxica sobre a que se apoian as investigacións máis recentes por sistemas propulsores mediante motores térmicos e *híbridos	CG4 CG5	CT2 CT7
Coñecer os tipos, o funcionamento e as aplicacións de propulsores mediante motores e térmicos e *Híbridos	CG6 CG7	CT9 CT10
Resolver problemas derivados do ámbito da materia de forma autónoma e en colaboración con outros.	CG11	CT17
Dar explicacións sobre as implicacións #ambiental e de sustentabilidade dun determinado problema.		
Realizar a resolución de problemas inherentes a máquinas propulsoras térmicas		
Realizar análises experimentais para avaliar as curvas características de funcionamento de motores térmicos a plena carga e parcial		
Redacta informes de deseño cálculo e ensaio xustificando os seus resultados, extraendo conclusións		
Profundar nas técnicas de eficiencia enerxética en sistemas *motorpropulsores		
Dominar as técnicas actuais dispoñibles para a análise de sistemas *motorpropulsores		

Contidos	
Topic	
1. Introdución aos *sitemas *motopropulsores	1.1 Definición 1.2 Clasificación

2. Ciclos teóricos	2.1 Introdución 2.2 Ciclo de aire frito *estandar 2.3 Ciclo *MEP 2.4 Ciclo *MEC 2.5 Ciclo aire-fuel
3. Ciclo real	3.1 Diferenzas do ciclo real fronte o ciclo teórico 3.2 Particularidades dos *MEP 3.3 Particularidades dos *MEC
4. Renovación da carga nos motores de 4*T	4.1 Introdución 4.2 Rendemento *volumétrico 4.3 Factores que afectan o rendemento *volumétrico 4.4 Tecnoloxía da renovación da carga dos 4*T 4.5 Estado da arte e tendencias
5. Renovación da carga nos motores de 2*T	5.1 Introdución 5.2 Definicións 5.3 Tecnoloxía da renovación da carga dos 2*T 5.4 Estado da arte e tendencias
6. *Sobrealimentación	6.1 Introdución 6.2 Tipos 6.3 Vantaxes e inconvenientes 6.4 *Sobrealimentación mecánica 6.5 *Turbosobrealimentación 6.6 Estado da arte e tendencias
7. Requisitos da mestura nos *MEP	7.1 Introdución 7.2 Mestura *óptima 7.3 Sistemas de *dosificación 7.4 Estado da arte e tendencias
8. Combustión nos *MEP	8.1 Introdución á combustión *premezclada 8.2 Etapas da combustión 8.3 Avance de aceso 8.4 Patoloxías da combustión *MEP 8.5 Carga *estratificada 8.6 Novas técnicas en *MEP
9. Combustión nos *MEC	9.1 Introdución á combustión por difusión 9.2 Etapas da combustión 9.3 Inxección directa *vs indirecta 9.4 Sistemas de inxección *MEC 9.5 Novas técnicas en *MEC
10. Perdas de calor e sistema de refrixeración	10.1 Introdución 10.2 Perdas de calor 10.3 Compoñentes do sistema de refrixeración
11. Perdas mecánicas e sistema de *lubricación	11.1 Introdución 11.2 *Regimenes de *lubricación 11.3 Perdas mecánicas 11.4 Compoñentes do sistema de *lubricación
12. Semellanza e deseño de motores	12.1 Introdución 12.2 Semellanza aplicada ao motor térmico 12.3 Criterios de deseño e selección de motores 12.4 Aplicación a casos prácticos 12.5 Estado da arte e tendencias
13. Outros sistemas de *motopropulsión	13.1 Tipos de sistemas *motopropulsores 13.2 *Turbinas de gas 13.3 *Motopropulsión *híbrida 13.4 Motores térmicos non convencionais 13.5 Tendencias

Planificación

	Class hours	Hours outside the classroom	Total hours
Prácticas con apoio das TIC	9	15	24
Prácticas de laboratorio	9	14.5	23.5
Lección maxistral	32.5	20	52.5
Exame de preguntas de desenvolvemento	0	35	35
Traballo	0	15	15

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

Metodoloxía docente

	Description
Prácticas con apoio das TIC	Clases prácticas *asitidas por computador en grupos de 20 alumnos
Prácticas de laboratorio	Clases prácticas en grupos de 20 alumnos no laboratorio da materia
Lección maxistral	Lección maxistral en aula

Atención personalizada

Methodologies	Description
Lección maxistral	Docencia en aula
Prácticas con apoio das TIC	Software AVL-Boost para la simulación de motores
Prácticas de laboratorio	- Ensayo de motor térmico - Despiece de un motor - Análisis de las emisiones de un motor diesel con EGR

Avaliación

	Description	Qualification	Evaluated Competencess	
Exame de preguntas de desenvolvemento	Proba escrita que poderá constar de: cuestións teóricas, cuestións prácticas, resolución de exercicios/problemas, tema a desenvolver, etc. (Puntuación mínima...)	70-100	CG4 CG5 CG6 CG7 CG11	CT2 CT7 CT9 CT10
Traballo	Traballos no que o alumno empregará os coñecementos e ferramentas adquiridos durante o curso. (Puntuación ata...)	30-0	CG4 CG5 CG6 CG7 CG11	CT2 CT7 CT9 CT10 CT17

Other comments on the Evaluation

Por acordo da Comisión Permanente da Escola de Enxeñaría Industrial, celebrada o 12 de xuño de 2015: Compromiso ético: Espérase que o alumno presente un comportamento ético adecuado. No caso de detectar un comportamento non ético (copia, plaxio, utilización de aparellos electrónicos non autorizados, e outros) considerarase que o alumno non reúne os requisitos necesarios para superar a materia. Neste caso a cualificación global no presente curso académico será de suspenso (0.0).

Bibliografía. Fontes de información

Basic Bibliography

Payri, F. y Desantes, J.M., **MOTORES DE COMBUSTIÓN INTERNA ALTERNATIVOS**,

Complementary Bibliography

Heywood, John B, **INTERNAL COMBUSTION ENGINES FUNDAMENTALS**, Ed. Mc Graw Hill,

Muñoz, Manuel, **TURBOMÁQUINAS TÉRMICAS: Fundamentos de diseño termodinámico**, Universidad Politécnica de Madrid,

Charles F. Taylor, **THE INTERNAL COMBUSTION ENGINE IN THEORY AND PRACTICE**,

Recomendacións

Subjects that continue the syllabus

Vehículos automóbiles híbridos e eléctricos/V12G380V01944

Subjects that are recommended to be taken simultaneously

Automóbiles e ferrocarrís/V12G380V01941
Sistemas fluidomecánicos e materiais avanzados para o transporte/V12G380V01942

Subjects that it is recommended to have taken before

Mecánica de fluídos/V12G380V01405
Teoría de máquinas e mecanismos/V12G380V01306
Termodinámica e transmisión de calor/V12G380V01302
Enxeñaría térmica I/V12G380V01501

Other comments

Por acordo da Comisión Permanente da Escola de Enxeñaría Industrial, celebrada o 12 de xuño de 2015:

Requisitos: Para matricularse nesta materia é necesario superar ou ben estar matriculado de todas as materias dos cursos inferiores ao curso no que está situada esta materia.

En caso de discrepancias prevalecerá a versión en castelán de está guía.

Plan de Continxencias

Description

=== MEDIDAS EXCEPCIONAIS PLANIFICADAS ===
Ante a incerta e imprevisible evolución da alerta sanitaria provocada pola COVID- 19, a Universidade establece una planificación extraordinaria que se activará no momento en que as administracións e a propia institución o determinen atendendo a criterios de seguridade, saúde e responsabilidade, e garantindo a docencia nun escenario non presencial ou non totalmente presencial. Estas medidas xa planificadas garanten, no momento que sexa preceptivo, o desenvolvemento da docencia dun xeito mais áxil e eficaz ao ser coñecido de antemán (ou cunha ampla antelación) polo alumnado e o profesorado a través da ferramenta normalizada e institucionalizada das guías docentes DOCNET.

=== ADAPTACIÓN DAS METODOLOXÍAS ===
- A metodoloxía docente se adaptará as infraestructuras dispoñibles sen que se altere de forma algunha o temario.
- O alumnado será atendido de forma telemática.
- A avaliación se fara de forma telemática manténdose a estrutura e o sistema que se expón nesta guía.

En resumo, se fará unha adaptación completa ás ferramentas existentes sen que cambie o alcance de materia, o temario ou o método de evaluación máis alá do que estas ferramentas esixan.

IDENTIFYING DATA				
Vehículos automóbiles híbridos e eléctricos				
Subject	Vehículos automóbiles híbridos e eléctricos			
Code	V12G380V01944			
Study programme	Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	4	2c
Teaching language				
Department	Enxeñaría mecánica, máquinas e motores térmicos e fluídos			
Coordinator	Peláez Lourido, Gerardo			
Lecturers	Peláez Lourido, Gerardo			
E-mail	gpelaez@uvigo.es			
Web				
General description	Estudo e revisión de conceptos de Electrónica Aplicada básicos en automoción conxuntamente cos sistemas e compoñentes mecánicos do *vehiculos *híbridos e eléctricos, incluíndo o seu deseño estrutural, *rotodinámica e seguridade.			

Competencias	
Code	
CG4	CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial na especialidade de Mecánica.
CE13	CE13 Coñecemento dos principios de teoría de máquinas e mecanismos.
CE20	CE20 Coñecementos e capacidades para o cálculo, deseño e ensaio de máquinas.
CT2	CT2 Resolución de problemas.
CT9	CT9 Aplicar coñecementos.
CT10	CT10 Aprendizaxe e traballo autónomos.
CT17	CT17 Traballo en equipo.
CT20	CT20 Capacidade para comunicarse con persoas non expertas na materia.

Resultados de aprendizaxe			
Learning outcomes	Competences		
□ Comprender as necesidades dinámicas do automóbil. □ Adquirir habilidades para o deseño de elementos encamiñados á redución de consumos e emisións. □ Coñecer o deseño mecánico dos sistemas de propulsión alternativos e de baixas ou nulas emisións. □ Capacidade para desenvolver os diferentes aspectos mecánicos do vehículo para optimizar a súa eficiencia enerxética.	CG4	CE13 CE20	CT2 CT9 CT10 CT17 CT20
O alumno debe adquirir as seguintes capacidades: - Distinguir entre vehículos *híbridos *PHEV, micro-*híbridos e eléctricos. - Tipos de Baterías empregadas incluíndo Baterías *inerciales. - Destreza no emprego de ferramentas de análises e simulación de sistemas *multicuerpo aplicadas á dinámica de vehículos *híbridos. - O alumno debe adquirir fundamentos de *rotodinámica. - Destrezas na *parametrización de *variadores para motores *asíncronos. - Principios de análise estrutural aplicada a vehículos. - Coñecemento dos sistemas de almacenamento de enerxía, carga e centrais (*electrolineras).	CG4	CE13 CE20	CT2 CT9 CT10 CT17 CT20

Contidos	
Topic	
Introdución e antecedentes. O *Girobus. Evolución dos motores eléctricos e electrónica de Potencia Aplicada en Automoción.	Falta de eficiencia relativa dos motores de *combustion.
Sistemas e Compoñentes do vehículo *híbrido e eléctrico.Caixas de Cambios.	Caixas de cambio convencionais. Aplicacións dos trens *epicicloidales aos vehículos *híbridos.

Vehículos *hibridos e o medio ambiente. Deseño do sistema propulsor.	A redución do petróleo consumido no sector do transporte persoal como factor esencial para conseguir a sustentabilidade enerxética e #ambiental. *Clasificacion dos tipos de motores eléctricos utilizados nos *PHEV. Normativa EURO-6.
Conceptos de *Rotodinámica e Seguridade.	Estudo dun *rotor de *Jeffcott. Resposta en frecuencia. *Orbitas. Equilibrado de eixos flexibles.
Sistemas de almacenamento de enerxía.	Baterías convencionais. Baterías *inerciales.
Ferramentas de Análise Dinámica e simulación de vehículos eléctricos.	- Análise dinámica mediante ferramentas de simulación de sistemas *multicuerpo.

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	18	40	58
Resolución de problemas	18	40	58
Prácticas de laboratorio	12	16	28
Estudo de casos	2	0	2
Informe de prácticas, prácticum e prácticas externas	2	0	2
Resolución de problemas e/ou exercicios	2	0	2
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente

	Description
Lección maxistral	Exposición dos contidos.
Resolución de problemas	Resolución analítica e numérica con axuda do *computador contrastando os resultados.
Prácticas de laboratorio	Análise experimental da resposta dinámica de distintos compoñentes de vehículos.

Atención personalizada

Methodologies	Description
Resolución de problemas	Resolución analítica e verificación de resultados por vía numérica con axuda de *Matlab.

Avaliación

	Description	Qualification	Evaluated Competencess		
Estudo de casos	Estudo da resposta dinámica dos elementos de máquinas involucrados en vehículos.	10	CG4	CE13 CE20	CT2 CT9 CT10 CT17 CT20
Informe de prácticas, prácticum e prácticas externas	Presentación dun *mini proxecto sobre algún dos contidos da materia.	10	CG4	CE13 CE20	CT2 CT9 CT10 CT17 CT20
Resolución de problemas e/ou exercicios	Cuestións breves ou tipo test relativas á materia.	80	CG4	CE13 CE20	CT2 CT9 CT10

Other comments on the Evaluation

Para os que non sigan a avaliación continua realizarán un exame distinto aos que se a sigan sobre toda a materia.

Compromiso ético: Espérase que o alumno presente un comportamento ético adecuado. No caso de detectar un comportamento non ético (copia, plaxio, utilización de aparellos electrónicos non autorizado, e outros) considérase que o alumno non reúne os requisitos necesarios para superar a materia. Neste caso a cualificación global no actual curso académico será de suspenso (0.0).

Non se permitirá a utilización de ningún dispositivo electrónico durante as probas de avaliación salvo autorización expresa. O feito de introducir un dispositivo electrónico non autorizado na aula de exame será considerado motivo de non superación da materia no presente curso académico e a cualificación global será de suspenso (0.0).

Bibliografía. Fontes de información

Basic Bibliography

Robert C. Eiseman Sr. and Robert C. Eiseman Jr., **Machinery Malfuction Diagnosis and Correction**,

James Mauricio Correa Sánchez Y Josep Tornero Montserrat (Dir), **Modelado y simulación dinámica de vehículos de competición de bajo consumo**, Universidad Politécnica de Valencia, 2010

Complementary Bibliography

Parviz Nikravesh, **Planar Multibody Dinamics**, CRC Press Grupo Taylor, 2008

Recomendacións

Subjects that it is recommended to have taken before

Física: Física I/V12G380V01102
Física: Física II/V12G380V01202
Teoría de máquinas e mecanismos/V12G380V01306

Other comments

Para matricularse nesta materia é necesario superar ou ben estar matriculado de todas as materias dos cursos inferiores ao curso en que está situada esta materia.

En caso de discrepancias, prevalecerá a versión en castelán desta guía.

Plan de Continxencias

Description

Mantéñense os contidos e os criterios de avaliación, adecuándose as metodoloxías e a tipoloxía de probas aos medios *telemáticos que se poñan a disposición, en caso de ser necesario.

IDENTIFYING DATA				
Enxeñaría do transporte				
Subject	Enxeñaría do transporte			
Code	V12G380V01945			
Study programme	Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	4	1c
Teaching language				
Department	Enxeñaría mecánica, máquinas e motores térmicos e fluídos			
Coordinator	Peláez Lourido, Gerardo			
Lecturers	Peláez Lourido, Gerardo			
E-mail	gpelaez@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	VISION XERAL DOS MODOS DE TRANSPORTE, MECANISMOS E MAQUINAS INVOLUCRADAS NOS MESMOS.			

Competencias	
Code	
CG4	CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial na especialidade de Mecánica.
CE13	CE13 Coñecemento dos principios de teoría de máquinas e mecanismos.
CE20	CE20 Coñecementos e capacidades para o cálculo, deseño e ensaio de máquinas.
CT2	CT2 Resolución de problemas.
CT9	CT9 Aplicar coñecementos.
CT10	CT10 Aprendizaxe e traballo autónomos.
CT17	CT17 Traballo en equipo.
CT20	CT20 Capacidade para comunicarse con persoas non expertas na materia.

Resultados de aprendizaxe			
Learning outcomes	Competences		
Comprender os aspectos básicos de diferentes alternativas de manutención e transporte en calquera ámbito.	CG4	CE13 CE20	CT2 CT9
Dominar as técnicas actuais dispoñibles para a análise de movemento de cargas ou persoas no ámbito industrial.			CT10 CT17
Profundar nas técnicas de movemento de cargas ou persoas no ámbito industrial.			CT20
Adquirir habilidades sobre o proceso de análise de movemento de cargas ou persoas no ámbito industrial.			
Capacidade de deseñar sistemas, compoñentes ou procesos que se axusten a unhas necesidades de transporte específicas, utilizando os métodos, técnicas e ferramentas máis adecuados en cada caso.			
Capacidade de avaliación crítica no ámbito industrial do movemento de cargas ou persoas.			

Contidos	
Topic	
Introdución á Enxeñaría do Transporte, movemento de cargas e elementos de guindastres	Introdución á Enxeñaría do Transporte Movemento de Cargas Elementos de Suspensión Elementos flexibles Elementos varios: Poleas, Aparellos, Tambores, Carrís e Rodas Accionamientos
Guindastres	Tipos de guindastres Guindastres Interiores ou de nave Guindastres Exteriores: porto, estaleiro ou obra
Transporte vertical	O ascensor: Tipos, funcionamento, partes mecánicas e eléctricas, control. Escaleiras mecánicas e Plataformas móbiles
Transportadores e Elevadores	Elevadores simples e bandas transportadoras

Planificación			
	Class hours	Hours outside the classroom	Total hours
Lección maxistral	39	60	99

Prácticas de laboratorio	12	32	44
Exame de preguntas de desenvolvemento	2	0	2
Informe de prácticas, prácticum e prácticas externas	0	5	5

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

Metodoloxía docente

	Description
Lección maxistral	CLASE MAXISTRAL NA QUE SE EXPOÑEN OS CONTIDOS TEORICOS-PRACTICOS POR MEDIOS TRADICIONAIS (LOUSA) E RECURSOS MULTIMEDIA.
Prácticas de laboratorio	REALIZACION DE TAREFAS PRACTICAS EN LABORATORIO DOCENTE/AULA INFORMATICA

Atención personalizada

Methodologies	Description
Lección maxistral	
Prácticas de laboratorio	

Tests	Description
Exame de preguntas de desenvolvemento	
Informe de prácticas, prácticum e prácticas externas	

Avaliación

	Description	Qualification	Evaluated Competencess		
Prácticas de laboratorio	*REALIZACION DE TAREFAS PRACTICAS EN LABORATORIO DOCENTE/AULA *INFORMATICA	0			
Exame de preguntas de desenvolvemento	*EVALUACION DOS COÑECEMENTOS *ADQUIRDOS MEDIANTE UN EXAME *TEORICO-PRACTICO	80	CG4	CE13 CE20	CT2 CT9 CT10 CT17 CT20
Informe de prácticas, prácticum e prácticas externas	AVALIÁSESE A ASISTENCIA E A *REALIZACION DAS MEMORIAS DE PRACTÍCALAS REALIZADAS NO CURSO.	20	CG4	CE13 CE20	CT2 CT9 CT10 CT17 CT20

Other comments on the Evaluation

Dentro do peso do exame e informe de prácticas, a avaliación poderá ser mediante a realización de traballos tutelados, non necesariamente probas *evaluatorias.Para os que non sigan a avaliación continua realizarán un exame distinto aos que si a sigan sobre toda a materia.COMPROMISO ÉTICO: ESPÉRASE QUE O ALUMNO PRESENTE UN COMPORTAMENTO ÉTICO ADECUADO. EN CASO DE DETECTAR UN COMPORTAMENTO NON ÉTICO (COPIA, PLAXIO, UTILIZACIÓN DE APARELLOS ELECTRÓNICOS NON AUTORIZADOS, E OUTROS) CONSIDERARASE QUE O ALUMNO NON REÚNE Os REQUISITOS NECESARIOS PARA SUPERAR A MATERIA. NESTE CASO A CUALIFICACIÓN GLOBAL NO PRESENTE CURSO ACADÉMICO SERÁ DE SUSPENSO (0.0).

Bibliografía. Fontes de información

Basic Bibliography

HOWARD I. SHAPIRO, **Cranes and derricks**, McGraw-Hill,

Complementary Bibliography

W.E. ROSSNAGEL, **Handbook of rigging for construction and industrial operations**, McGraw-Hill,
ANTONIO MIRAVETE, **Los Transportes en la Ingeniería Industrial, Teoría y problemas**, REVERTE,
ANTONIO MIRAVETE, **El Libro del transporte vertical**, Servicio de Publicaciones de la Universidad de Zar,

Recomendacións

Other comments

REQUISITOS: PARA MATRICULARSE NESTA MATERIA É NECESARIO TER SUPERADO OU BEN ESTAR MATRICULADO DE TODAS AS MATERIAS DOS CURSOS INFERIORES AO CURSO NO QUE ESTÁ EMPRAZADA ESTA MATERIA.

En caso de discrepancias prevalecerá a versión en castelán desta guía.

Plan de Continxencias

Description

Mantéñense os contidos e os criterios de avaliación, adecuándose as metodoloxías e a tipoloxía de probas aos medios *telemáticos que se poñan a disposición, en caso de ser necesario.

IDENTIFYING DATA				
Internships: Internships				
Subject	Internships: Internships			
Code	V12G380V01981			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Izquierdo Belmonte, Pablo Eguizábal Gándara, Luis Eduardo			
Lecturers	Urgal González, Begoña			
E-mail	pabloizquierdob@uvigo.es eguizaba@uvigo.es			

----- UNPUBLISHED TEACHING GUIDE -----

IDENTIFYING DATA				
Traballo de Fin de Grao				
Subject	Traballo de Fin de Grao			
Code	V12G380V01991			
Study programme	Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	12	Mandatory	4	2c
Teaching language	Castelán Galego Inglés			
Department	Enxeñaría dos materiais, mecánica aplicada e construción			
Coordinator	Collazo Fernández, Antonio			
Lecturers	Collazo Fernández, Antonio			
E-mail	acollazo@uvigo.es			
Web				
General description	O Traballo de Fin de Grao (TFG) é un traballo orixinal e persoal que cada estudante realizará de forma autónoma baixo tutorización docente, e debe permitirlle mostrar de forma integrada a adquisición dos contidos formativos e as competencias asociadas ao título. A súa definición e contidos están explicados de forma máis extensa no Regulamento do Traballo Fin de Grao aprobado pola Xunta de Escola da Escola de Enxeñería Industrial o 21 de xullo de 2015.			

Competencias	
Code	
CG1	CG1 Capacidade para a redacción, sinatura e desenvolvemento de proxectos no ámbito da enxeñaría industrial, na especialidade de Mecánica, que teñan por obxecto, a construción, reforma, reparación, conservación, demolición, fabricación, instalación, montaxe ou explotación de: estruturas, equipos mecánicos, instalacións enerxéticas, instalacións eléctricas e electrónicas, instalacións e plantas industriais, e procesos de fabricación e automatización.
CG2	CG2 Capacidade para a dirección das actividades obxecto dos proxectos de enxeñaría descritos na competencia CG1.
CG3	CG3 Coñecemento en materias básicas e tecnolóxicas que os capacite para a aprendizaxe de novos métodos e teorías, e os dote de versatilidade para adaptarse a novas situacións.
CG4	CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial na especialidade de Mecánica.
CG10	CG10 Capacidade para traballar nun medio multilingüe e multidisciplinar.
CG12	CG12 Exercicio orixinal a realizar individualmente e presentar e defender ante un tribunal universitario, consistente nun proxecto no ámbito das tecnoloxías específicas da Enxeñería Industrial na especialidade Mecánica de natureza profesional no que se sinteticen e integren as competencias adquiridas nos ensinos.
CT4	CT4 Comunicación oral e escrita de coñecementos en lingua estranxeira.
CT12	CT12 Habilidades de investigación.
CT13	CT13 Capacidade para comunicarse oralmente e por escrito en lingua galega.

Resultados de aprendizaxe		
Learning outcomes	Competences	
Procura, ordenación e estructuración de información sobre calquera tema.	CG1 CG2 CG3 CG4 CG10 CG12	CT12
Elaboración dunha memoria na que se recollan, entre outros, os seguintes aspectos: antecedentes, problemática ou estado da arte, obxectivos, fases do proxecto, desenvolvemento do proxecto, conclusións e liñas futuras.	CG1 CG2 CG3 CG4 CG10 CG12	CT4 CT12 CT13
Deseño de equipos, prototipos, programas de simulación, etc, segundo especificacións.	CG1 CG2 CG3 CG4 CG10 CG12	CT12
No momento de realizar a solicitude da defensa do TFG, o alumno deberá xustificar a adquisición dun nivel adecuado de competencia en lingua inglesa.		CT4

Contidos	
Topic	
Proxectos clásicos de enxeñaría	Poden versar, por exemplo, sobre o deseño e mesmo a fabricación dun prototipo, a enxeñaría dunha instalación de produción, ou a implantación dun sistema en calquera campo industrial. Polo xeral, neles desenvólvese sempre a parte documental da memoria (cos seus apartados de cálculos, especificacións, estudos de viabilidade, seguridade, etc. que se precisen en cada caso), planos, prego de condicións e orzamento e, nalgúns casos, tamén se contempla os estudos propios da fase de execución material do proxecto.
Estudos técnicos, organizativos e económicos	Consistentes na realización de estudos relativos a equipos, sistemas, servizos, etc., relacionados cos campos propios da titulación, que traten un ou máis aspectos relativos ao deseño, planificación, produción, xestión, explotación e calquera outro propio do campo da enxeñaría, relacionando cando cumpra alternativas técnicas con avaliacións económicas e discusión e valoración dos resultados.
Traballos teórico-experimentais	De natureza teórica, computacional ou experimental, que constitúan unha contribución á técnica nos diversos campos da enxeñaría incluíndo, cando cumpra, avaliación económica e discusión e valoración dos resultados.

Planificación			
	Class hours	Hours outside the classroom	Total hours
Actividades introdutorias	5	25	30
Traballo tutelado	15	210	225
Presentación	1	14	15
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente	
	Description
Actividades introdutorias	O alumno realizará, de forma autónoma, unha procura bibliográfica, lectura, procesamento e elaboración de documentación.
Traballo tutelado	O estudante, de maneira individual, elabora unha memoria segundo as indicacións do Regulamento do Traballo Fin de Grao da EEI.
Presentación	O alumnado debe preparar e defender o traballo realizado diante dun tribunal de avaliación segundo as indicacións do Regulamento do Traballo Fin de Grao da EEI.

Atención personalizada	
Methodologies	**Description**
Traballo tutelado	Cada alumno terá un titor e/ou un co-titor encargados de guiarlle, e que lle marcarán as directrices oportunas para realizar o TFG.

Avaliación				
	Description	Qualification	Evaluated Competencess	
Traballo tutelado	A cualificación da memoria do Traballo Fin de Grao levará a cabo segundo o especificado no Regulamento do Traballo Fin de Grao da Escola de Enxeñaría Industrial.	70	CG1 CG2 CG3 CG4 CG10 CG12	CT4 CT12
Presentación	A defensa do Traballo Fin de Grao levará a cabo segundo o especificado no Regulamento do Traballo Fin de Grao da Escola de Enxeñaría Industrial.	30	CG1 CG2 CG3 CG4 CG10 CG12	CT4 CT12

Other comments on the Evaluation

Bibliografía. Fontes de información
Basic Bibliography
Complementary Bibliography

Recomendacións

Other comments

Compromiso ético: Espérase que o alumno presente un comportamento ético adecuado. No caso de detectar un comportamento non ético (copia, plaxio ou outros) considerarase que a cualificación global no presente curso académico será de suspenso (0.0).

Requisitos: Para matricularse no Traballo Fin de Grao é necesario superar ou ben estar matriculado de todas as materias dos cursos inferiores ao curso no que está situado o TFG.

Información importante: No momento da defensa do TFG, o alumno deberá ter todas as materias restantes do título superadas, tal como establece o artigo 7.7 do Regulamento para a realización do Traballo Fin de Grao da Universidade de Vigo.

A orixinalidade da memoria será obxecto de estudo mediante unha aplicación informática de detección de plaxios.

Plan de Continxencias

Description

As metodoloxías e as probas se realizarán, de ser necesario, adecuándoas ós medios telemáticos que se poñan a disposición do profesorado, ademais da documentación facilitada a través de FAITIC e outras plataformas, correo electrónico, etc. As exposicións poderán desenvolverse, se é preciso, por medios telemáticos realizándose dese xeito a través das distintas ferramentas postas a disposición do profesorado.

IDENTIFYING DATA				
Prácticas en empresa/asignatura optativa				
Subject	Prácticas en empresa/asignatura optativa			
Code	V12G380V01999			
Study programme	Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Optional	4	2c
Teaching language	Castelán Galego			
Department	Organización de empresas e márketing			
Coordinator	Izquierdo Belmonte, Pablo Eguizábal Gándara, Luis Eduardo			
Lecturers	Urgal González, Begoña			
E-mail	pabloizquierdob@uvigo.es eguizaba@uvigo.es			
Web	http://eei.uvigo.es			
General description	Mediante a realización de prácticas en empresa o alumno poderá aplicar os coñecementos e as competencias adquiridas durante os seus estudos, o que permitirá complementar e reforzar a súa formación e facilitar a súa incorporación ao mercado laboral.			

Competencias	
Code	
CG1	CG1 Capacidade para a redacción, sinatura e desenvolvemento de proxectos no ámbito da enxeñaría industrial, na especialidade de Mecánica, que teñan por obxecto, a construción, reforma, reparación, conservación, demolición, fabricación, instalación, montaxe ou explotación de: estruturas, equipos mecánicos, instalacións enerxéticas, instalacións eléctricas e electrónicas, instalacións e plantas industriais, e procesos de fabricación e automatización.
CG2	CG2 Capacidade para a dirección das actividades obxecto dos proxectos de enxeñaría descritos na competencia CG1.
CG3	CG3 Coñecemento en materias básicas e tecnolóxicas que os capacite para a aprendizaxe de novos métodos e teorías, e os dote de versatilidade para adaptarse a novas situacións.
CG4	CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial na especialidade de Mecánica.

Resultados de aprendizaxe	
Learning outcomes	Competences
Capacidade para adaptarse ás situacións reais da profesión.	CG1 CG2 CG3 CG4
Integración en grupos de traballo multidisciplinares.	CG2 CG3 CG4
Responsabilidade e traballo autónomo.	CG1 CG2 CG3 CG4

Contidos	
Topic	
Integración nun grupo de traballo nunha empresa.	O alumno integrarase no contexto organizativo dunha empresa, téndose que coordinar cos diferentes membros do grupo de traballo ao que sexa asignado.
Realización de actividades ligadas ao desempeño da profesión.	Ao alumno encomendaráselle unha serie de tarefas relacionadas cos coñecementos e coas competencias dos seus estudos.

Planificación			
	Class hours	Hours outside the classroom	Total hours
Prácticum, Practicas externas e clínicas	0	150	150
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente

	Description
Prácticum, Practicas externas e clínicas	O alumno integrarase nun grupo de traballo nunha empresa onde terá a oportunidade de poñer en práctica os coñecementos e as competencias adquiridas durante os seus estudos, e así complementar e reforzar a súa formación.

Atención personalizada

Methodologies	Description
Prácticum, Practicas externas e clínicas	O alumno dispoñerá dun titor na empresa onde fará a súas prácticas e dun titor académico.

Avaliación

	Description	Qualification	Evaluated Competencess
Prácticum, Practicas externas e clínicas	Os estudantes en prácticas deberán manter un contacto continuado non só co seu titor na empresa, senon tamén co seu titor académico. Ao concluir as prácticas, os alumnos deberán entregar ao seu titor académico unha memoria final e o informe en documento oficial D6-Informe do estudante. Na avaliación terase en conta a valoración do desempeño do alumno realizada polo titor na empresa, o seguimento realizado polo titor académico e os informes entregados polo alumno.	100	CG1 CG2 CG3 CG4

Other comments on the Evaluation

Adicionalmente ao xa exposto nesta guía docente é preciso facer as seguintes aclaracións:
1º. Esta materia rexerase polo establecido no Regulamento de Prácticas en Empresa da EEI (http://eei.uvigo.es/opencms/export/sites/eei/eei_gl/documentos/escola/Normativa/practicas_empresa.pdf).
2º. A Escola fará pública a oferta de prácticas en empresa curriculares entre as que o alumnado, que cumpra os requisitos descritos no artigo 6 do citado regulamento, deberá facer a súa escolla dentro do prazo fixado ao efecto. O procedemento de realización de prácticas en empresa curriculares está establecido no artigo 7 do regulamento.
3º. A duración das prácticas pode chegar a ser ata de un máximo de 240 horas, para que o alumno saque o maior proveito da súa estadía na empresa. Será a empresa na súa oferta de prácticas a que estipulará a duración das mesmas.

Bibliografía. Fontes de información

Basic Bibliography

Complementary Bibliography

Recomendacións

Plan de Continxencias

Description

=== MEDIDAS EXCEPCIONAIS PLANIFICADAS ===
Ante a incerta e imprevisible evolución da alerta sanitaria provocada pola COVID- 19, a Universidade establece una planificación extraordinaria que se activará no momento en que as administracións e a propia institución o determinen atendendo a criterios de seguridade, saúde e responsabilidade, e garantindo a docencia nun escenario non presencial ou non totalmente presencial. Estas medidas xa planificadas garanten, no momento que sexa preceptivo, o desenvolvemento da docencia dun xeito mais áxil e eficaz ao ser coñecido de antemán (ou cunha ampla antelación) polo alumnado e o profesorado a través da ferramenta normalizada e institucionalizada das guías docentes DOCNET.

=== ADAPTACIÓN DAS METODOLOXÍAS ===
A metodoloxía docente adaptarase ás circunstancias, podéndose desenvolver as prácticas empregando a modalidade do teletraballo, de acordo á planificación que estableza a empresa que acolla ao alumno.

=== ADAPTACIÓN DA AVALIACIÓN ===
Non se producirán cambios na metodoloxía de avaliación.