



(*)Escola de Enxeñaría Industrial

Information

For additional information about the centre and its degrees visit the centre's website <https://eei.uvigo.es/>

Grado en Ingeniería Mecánica

Subjects

Year 3rd

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

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. Introducción 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	ATENCIÓN DE DÚBIDAS E PREGUNTAS FORMULADAS POLO ALUMNO
Resolución de problemas	ATENCIÓN DE DÚBIDAS E PREGUNTAS FORMULADAS POLO ALUMNO
Prácticas de laboratorio	ATENCIÓN DE DÚBIDAS E PREGUNTAS FORMULADAS POLO ALUMNO

Avaliación

	Description	Qualification	Evaluated Competences		
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 Fatic 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 desenvólvanse 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 modifícanse, 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

Trabalos a determinar que se evaluarán dentro da evaluación continua cun Peso dun 30 %.

IDENTIFYING DATA**Thermal engineering I**

Subject	Thermal engineering I			
Code	V12G380V01501			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits 9	Type Mandatory	Year 3rd	Quadmester 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

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 psychrometrics. Diagrams psychrometric. 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 Competences		
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	<p>Student previous activities to lectures (compulsory submission):</p> <p>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.</p> <p>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.</p>
Lecturing	<p>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.</p> <p>To improve the comprehension, the contents of the next lectures will be announced on Tema platform on a weekly basis.</p>
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 Competences		
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 = $K \times (\text{overall practice grade}) / (\text{nr of laboratory sessions})$

Qualification of conceptual tests = $K \times (\text{addition of tests} \times \text{grades}) / (\text{nr of tests})$

$K = (\text{nr of previous exercises delivered}) / (\text{total nr of previous exercises})$

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 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
-------------------	-------------

<input type="checkbox"/> Coñece os principais procesos de conformación e transformación de materiais usados na industria.	CG3	CE25	CT5
<input type="checkbox"/> Demostra capacidade para seleccionar o proceso de elaboración máis adecuado para a obtención de pezas básicas a partir dun material determinado.	CG4		CT7
<input type="checkbox"/> Coñece os principais procesos de unión dos materiais usados na industria.	CG5		CT9
<input type="checkbox"/> Comprende as complexas interrelacións 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.	CG6		CT10
<input type="checkbox"/> Coñece as características dos materiais máis habitualmente empregados en Enxeñaría.	CG11		CT15
<input type="checkbox"/> Coñece a evolución dos distintos tipos de materiais e dos procesos para a súa posible conformación.			CT17
<input type="checkbox"/> Coñece e aplica os criterios para a selección do material máis adecuado para unha aplicación concreta			
<input type="checkbox"/> Analiza e propón solucións operativas a problemas no ámbito da enxeñaría de materiais.			
<input type="checkbox"/> Interpreta, analiza, sintetiza e extrae conclusións e resultados de medidas e ensaios.			
<input type="checkbox"/> Redacta textos coa estrutura adecuada aos obxectivos de comunicación. Presenta o texto a un público coas estratexias e os medios adecuados			
<input type="checkbox"/> Demostra capacidades de comunicación e traballo en equipo.			
<input type="checkbox"/> Identifica as propias necesidades de información e utiliza os medios, espazos e servizos dispoñibles para deseñar e executar procuras adecuadas ao ámbito temático.			
<input type="checkbox"/> 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

- 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 *soldabilidade.
- Aliaxes estruturais
- Materiais compostos

Partes de laboratorio

Metalografía
 Ensayo de templabilidade
 Ensaos mecánicos
 Ensaos 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 *laboratorios 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 *unseguimento do traballo do alumno, así como resolver as *dificultades 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 artigos de revistas científicas
Seminario	no hay grupos C

Avaliación

	Description	Qualification	Evaluated Competences
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 manteráse 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 o alumno non reúne 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 Technology**, 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 determinen 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.

- 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 desprazador 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 seguimento 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	Explicanse 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 Competences	
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 - cuestións prácticas - exercicios/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		
<input type="checkbox"/> Coñecer a base sobre a que se apoian as actividades relacionadas con a Organización e a Xestión de a Produción.	CG8	CE15	CT1
<input type="checkbox"/> Coñecer o alcance de as distintas actividades relacionadas con a produción.	CG9	CE17	CT2
<input type="checkbox"/> Adquirir unha visión de conxunto para a execución de as actividades relacionadas con a organización e xestión de a produción.			CT7
<input type="checkbox"/> 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			CT8
			CT9
			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. INTRODUCCIÓN. COMPOÑENTES. MÉTODOS DE PREVISIÓN DE A DEMANDA: CUANTITATIVOS E CUALITATIVOS
PARTE III. XESTIÓN DE INVENTARIOS E XESTIÓN DE PRODUCCIÓN	3.CONCEPTOS BÁSICOS DE Os INVENTARIOS. CONTROL DE INVENTARIOS 4.XESTIÓN DE INVENTARIOS. MODELOS BÁSICOS
PARTE *IV. XESTIÓN DE PRODUCCIÓN EN EMPRESAS INDUSTRIAIS	5.PLANIFICACIÓN DE PRODUCCIÓN. PLAN AGREGADO. PLAN MESTRE DE PRODUCCIÓN 6.PLANIFICACIÓN DE NECESIDADES DE MATERIAIS (*MRP) 7.PLANIFICACIÓN DE CAPACIDADE. PROGRAMACIÓN DE PRODUCCIÓN: CRITERIOS E REGRAS BÁSICAS
PARTE *V. INTRODUCCIÓN Ao ESTUDO DO TRABALLO	8.INTRODUCCIÓN Ao ESTUDO DO TRABALLO. DISTRIBUCIÓN EN PLANTA
PARTE VIN. XESTIÓN LEAN	9.O ENFOQUE LEAN NA XESTIÓN. DEFINICIÓN E OBXECTIVOS. ELEMENTOS LEAN

PARTE *VII. INTRODUCCIÓN Á XESTIÓN DA CALIDADE, A SEGURIDADE E O MEDIO AMBIENTE	10. INTRODUCCIÓN Á XESTIÓN DA CALIDADE, A SEGURIDADE E O MEDIO AMBIENTE
PRÁCTICAS	1. PREVISIÓN DA DEMANDA 2. CONTROL E XESTIÓN DE INVENTARIOS 3. PLANIFICACIÓN DA PRODUCCIÓN *I 4. PLANIFICACIÓN DA PRODUCCIÓN *II 5. LISTAS DE MATERIAIS E OPERACIÓNS 6. PLANIFICACIÓN DA CAPACIDADE 7. PROGRAMACIÓN DA PRODUCCIÓN 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 Competences		
Exame de preguntas obxectivas	2 Teórico-Prácticas: Probas de avaliación continua que se realizarán a 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 puntuacións: 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 aproveitamento 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 unicamente en a convocatoria de Xaneiro/Xuño. En o resto de os casos: a) Aqueles alumnos que desenvolvan con aproveitamento 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 determinen 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, incorporárase 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 mostrárase 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	<p>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:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Be aware of the criteria used for the selection and use of standard parts. <input type="checkbox"/> Know about the CAD technologies used in geometrical modelling, and how to use them to produce engineering drawings. <input type="checkbox"/> Be able to perform analysis on the operation of mechanisms from the specifications in the engineering drawings. <input type="checkbox"/> Know how to apply geometrical tools to solve problems involving mechanisms, constructions, industrial facilities and installations. <input type="checkbox"/> 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 possess 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

THEORETICAL 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 tolerances. 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.	<p>9.1. Symbolic representation of structures.</p> <p>9.2. Detail drawings of metallic structures.</p> <p>9.3. Representation and dimensioning of welded joints.</p> <p>9.4. Drawings for metal-working.</p> <p>9.5. Symbols and diagrams for oil-hydraulic and pneumatic circuits.</p> <p>9.6. Symbols and diagrams for fluid conduction systems.</p>
10. Introduction to Industrial Design.	<p>10.1. Design. Types. Industrial Design: product, communication and corporate image.</p> <p>10.2. Design methodologies.</p> <p>10.3. Stages in the design process.</p> <p>10.4. Creativity in the design process.</p> <p>10.5. Assessment of design alternatives.</p> <p>10.6. DfX.</p>

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 be 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 subject.
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 Competences
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

Aguiar, 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 preferential use. The specific conditions for the re-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 paid 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 rixidos, determinando as accións ás que están sometidas segundo a normativa, os esforzos, as tensións e as deformacións. Trátase de adquirir capacidade para converter unha estrutura real nun modelo para a súa 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 cumprir as súas funcións, tendo en conta as accións actuantes, os criterios de seguridade e as bases de cálculo.	CG3	CE23	CT2
Adquirir capacidade para converter unha estrutura real nun modelo para o seu análise, e viceversa.	CG4		CT5
Identificar as tipoloxías e elementos máis importantes que se utilizan nas estruturas e construcións industriais.	CG5		CT8
Coñecer as condicións que rexen o comportamento das estruturas, nas súas diferentes tipoloxías.	CG6		CT9
Capacidade para determinar as leis de esforzos, as tensións e as deformacións nos elementos das estruturas.	CG11		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 construcións 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	Introducción 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 cálculo 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 Competences
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 CE23 CT2 CG4 CT5 CG5 CT8 CG6 CT9 CG11 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 avaliación 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 presentación e a portada cos datos a incluír 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 Fatic)

- 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 tutorial 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

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 Competences		
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 how 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 CAD/CAM - 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.
 - Elaborar 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-*aprendizaje 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 *oportunidad 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
