



(*)Escola de Enxeñaría Aeronáutica e do Espazo

Presentation

The School of Aeronautic and Space Engineering (EEAE) of the University of Vigo at the Campus of Ourense offers the degrees of the University of Vigo that are related both to bachelor's and to master's level in the field of aeronautical or aerospace engineering.

More information about the Center and its degrees is found in this document or on the web page (<http://aero.uvigo.es>).

Address

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Regulations and legislation

The information is available on the Center's web site (<http://aero.uvigo.es> in the section: School -> Regulations).

Grado en Ingeniería Aeroespacial

Subjects

Year 1st

Code	Name	Quadmester	Total Cr.
O07G410V01101	Mathematics: Calculus I	1st	6
O07G410V01102	Mathematics: Linear algebra	1st	6
O07G410V01103	Physics: Physics I	1st	6
O07G410V01104	Computer science	1st	6
O07G410V01105	Graphic expression: Graphic expression	1st	6
O07G410V01201	Mathematics: Calculus II	2nd	6
O07G410V01202	Physics: Physics II	2nd	6
O07G410V01203	Chemistry: Chemistry	2nd	6
O07G410V01204	Business: business technology and management	2nd	6
O07G410V01205	Aerospace technology	2nd	6

IDENTIFYING DATA

Mathematics: Calculus I

Subject	Mathematics: Calculus I			
Code	O07G410V01101			
Study programme	Grado en Ingeniería Aeroespacial			
Descriptors	ECTS Credits 6	Choose Basic education	Year 1st	Quadmester 1st
Teaching language	Galician English			
Department				
Coordinator	Area Carracedo, Iván Carlos			
Lecturers	Area Carracedo, Iván Carlos			
E-mail	area@uvigo.gal			
Web	http://area.webs.uvigo.es			
General description	The aim of this course is that the student acquires the techniques of differential calculus both in one and several variables, and integral calculus in one variables, necessary both for other courses of the degree and for professional practice.			

Skills

Code

A1	That the students demonstrate to possess and understand knowledge in an area of study that is part of the general education (second level), and often found at a level that, although based on advanced textbooks, also includes some aspects that involve knowledge from the avant-garde of the field of study
B2	Planning, documentation, project management, calculation and manufacturing in the field of aeronautical engineering (in accordance with what is established in section 5 of order CIN / 308/2009), aerospace vehicles, propulsion systems, aerospace materials, airport infrastructures, air navigation infrastructures and space management, air traffic and transport management systems.
C1	Capability to solve mathematical problems that may arise in engineering. Aptitude to apply the knowledge about: linear algebra; geometry; differential geometry; differential and integral calculation; differential equations and partial derivatives; numerical methods; numerical algorithm; statistics and optimization.
C32	Appropriate knowledge applied to engineering: methods of calculation and development of materials and defence systems; management of experimental techniques, equipment and measuring instruments; numerical simulation of the most significant physical-mathematical processes; inspection, quality control and fault detection techniques; their most appropriate methods and repair techniques.
D1	Capability of analysis, organization and planification.
D3	Capability of oral and written communication in native language
D4	Capability of autonomous learning and information management
D5	Capability to solve problems and draw decisions
D6	Capabiility for interpersonal communication
D8	Capabiility for critical and self-critical reasoning

Learning outcomes

Expected results from this subject

Training and Learning Results

Knowledge and understanding of the main concepts and techniques of differential calculus in one and several variables as well as of integral calculus in one variable and numerical integration	A1	B2	C1	D1
			C32	D3
				D4
				D5
				D6
				D8

Contents

Topic

Functions of one real variable.	Functions of one real variable. Limits. Continuity.
Differentiability of functions of one real variable.	Differentiability of functions of one real variable. Mean value theorems.
Mean value theorems. Limited expansions and Taylor's formula. Extrema.	Limited expansions and Taylor's formula. Extrema.
Integration of functions of one real variable	Primitives. Definite integral. Fundamental theorem of calculus. Geometric applications. Numerical integration
Sequences and series.	Sequences and series. Convergence. Numeric series of positive terms. Convergence criteria. Power series.

Functions of several real variables.	The n-dimensional euclidean space. Functions of several real variables. Limits. Continuity. Differentiability. Expansion and Taylor's formula. Relative extrema. Constrained optimization.
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Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	18	36	54
Problem solving	14	26.6	40.6
Introductory activities	1	1.4	2.4
Autonomous problem solving	5	9.5	14.5
Laboratory practical	12	24	36
Essay questions exam	2.5	0	2.5

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

Methodologies	
	Description
Lecturing	The professor will present in the theoretical classes the contents of the subject. Students will have basic reference texts for tracking the subject.
Problem solving	The professor will solve problems and exercises manually and the student will have to solve similar exercises to acquire the necessary skills.
Introductory activities	Activities to make contact and gather information on the students, and to present the subject.
Autonomous problem solving	The students will have to solve exercises independently to check the acquisition of the skills.
Laboratory practical	The professor will solve problems and exercises with computer tools and the student will have to solve similar exercises to acquire the necessary skills.

Personalized assistance	
Methodologies	Description
Lecturing	The professor will personally solve the doubts of students. The doubts will be solved in-person, specially during problems and laboratory lectures and during tutorials, and also by using the remote options available for the course.
Laboratory practical	The professor will personally solve the doubts of students. The doubts will be solved in-person, specially during problems and laboratory lectures and during tutorials, and also by using the remote options available for the course.
Problem solving	The professor will personally solve the doubts of students. The doubts will be solved in-person, specially during problems and laboratory lectures and during tutorials, and also by using the remote options available for the course.

Assessment		Description	Qualification	Training and Learning Results					
				A1	B2	C1	D1	C32	D3
Autonomous problem solving		Written tests and / or work to assess will be made to evaluate solving exercises and / or problems autonomously.	40						D4
									D5
									D6
									D8
Essay questions exam		A final exam on the contents of all the course will be made.	60	A1	B2	C1	D1	C32	D3
									D4
									D5
									D8

Other comments on the Evaluation

It is required to obtain at least 30% of the maximum of the mark of each of the blocks of the subject to pass the exam. The final exam will last at most 3 hours if there is no break or 5 hours if there is an intermediate break (being 3 hours the maximum for each part)

The evaluation system of June-July is the same as in December-January, maintaining the grades obtained for the resolution of problems and/or exercises and class attendance and participation.

Non-attending students to classes can take an exam in both December and July that covers 100% of the final grade

The dates of the final exams are published on the website of the Escola de Enxeñaría Aeronáutica e do Espazo.

Ethical commitment:

"It is expected is that students present an adequate ethical behavior. If a not appropriate ethical behavior is detected (copying, plagiarism, non authorized use of electronic devices, etc.) the student will not meet the requirements to pass the course. In this case the overall rating in the current academic year will be suspense (0.0). If necessary, a new exam to verify the acquisition of skills and knowledge by the student(s) involved could be performed."

It is recalled the prohibition of the use of mobile devices or laptops in exercises and practices since Real Decreto 1791/2010, of December 30, approving the Statute of University Students, establishes in its article 13.2.d), concerning the duties of university students, the duty to:

"Refrain from using or cooperating in fraudulent proceedings in the evaluation tests, in the works that are carried out or in official documents of the university".

Sources of information

Basic Bibliography

- J. Burgos, **Cálculo Infinitesimal de una variable**, McGraw-Hill, 2007
J. Burgos, **Cálculo Infinitesimal de varias variables**, McGraw-Hill, 2008
R. Larson et al., **Cálculo 1**, McGraw-Hill, 2010
R. Larson et al., **Cálculo 2**, McGraw-Hill, 2010
J. Rogawski, **Cálculo. Una variable**, Reverté, 2012
J. Rogawski, **Cálculo. Varias variables**, Reverté, 2012
- #### Complementary Bibliography
- A. García et al., **Cálculo I**, CLAGSA, 2007
A. García et al., **Cálculo II**, CLAGSA, 2002

Recommendations

Subjects that continue the syllabus

- Physics: Physics II/O07G410V01202
Mathematics: Calculus II/O07G410V01201
Aerospace technology/O07G410V01205

Subjects that are recommended to be taken simultaneously

- Physics: Physics I/O07G410V01103
Computer science/O07G410V01104
Mathematics: Linear algebra/O07G410V01102

Contingency plan

Description

In the event of exceptional circumstances:

Virtual teaching

The teaching activity will be carried out through Remote Campus reinforced with the use of the Moovi tele-teaching platform, without prejudice to the fact that other measures can be used to guarantee the accessibility of students to teaching content.

Tutorials

All tutoring sessions can be carried out by telematic means, either asynchronously (email, Moovi forums, etc.) or by videoconference, in this case by prior appointment.

Evaluation

The exams will be carried out in person unless otherwise indicated by the academic authorities. In any case, all the comments included in the Evaluation section remain valid.

IDENTIFYING DATA

Mathematics: Linear algebra

Subject	Mathematics: Linear algebra			
Code	O07G410V01102			
Study programme	Grado en Ingeniería Aeroespacial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	Galician			
Department				
Coordinator	Garcia Martinez, Xabier			
Lecturers	Garcia Martinez, Xabier			
E-mail	xabier.garcia.martinez@uvigo.es			
Web	http://aero.uvigo.es/gl/			
General description	This subject is part of Mathematics and it is taught in the first semester of the first course. The other subjects of Mathematics are: Calculus I, in the first semester of the first course and Calculus II in the second semester of the first course. Competences of linear algebra are acquired, being a part of them fundamental for the other subjects of Mathematics.			
	The subject has the character of basic training. It provides the mathematical basis to different disciplines in the field of the aeronautical engineering such as the calculation and manufacture of vehicles and numerical simulation.			
	English Friendly subject: International students may request from the teachers: a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Skills

Code

- A1 That the students demonstrate to possess and understand knowledge in an area of study that is part of the general education (second level), and often found at a level that, although based on advanced textbooks, also includes some aspects that involve knowledge from the avant-garde of the field of study
- B2 Planning, documentation, project management, calculation and manufacturing in the field of aeronautical engineering (in accordance with what is established in section 5 of order CIN / 308/2009), aerospace vehicles, propulsion systems, aerospace materials, airport infrastructures, air navigation infrastructures and space management, air traffic and transport management systems.
- C1 Capability to solve mathematical problems that may arise in engineering. Aptitude to apply the knowledge about: linear algebra; geometry; differential geometry; differential and integral calculation; differential equations and partial derivatives; numerical methods; numerical algorithm; statistics and optimization.
- C32 Appropriate knowledge applied to engineering: methods of calculation and development of materials and defence systems; management of experimental techniques, equipment and measuring instruments; numerical simulation of the most significant physical-mathematical processes; inspection, quality control and fault detection techniques; their most appropriate methods and repair techniques.
- D1 Capability of analysis, organization and planification.
- D3 Capability of oral and written communication in native language
- D4 Capability of autonomous learning and information management
- D5 Capability to solve problems and draw decisions
- D8 Capabilty for critical and self-critical reasoning

Learning outcomes

Expected results from this subject

Training and Learning Results

Knowledge and understanding of the main concepts, techniques and numerical methods of Linear Algebra.	A1	B2	C1	D1
Ability to apply them to other branches of Mathematics and Engineering Sciences.			C32	D3
			D4	
			D5	
			D8	

Contents

Topic

BLOCK I	1. Real and complex numbers. 2. Systems of linear equations.
BLOCK II	3. Vector spaces. 4. Linear transformations and matrices.

BLOCK III	5. Euclidean vector spaces. 6. Diagonalisation. Orthogonal transformations.
BLOCK IV	7. Numerical methods: resolution of systems of linear equations. Computation of eigenvalues.

Planning

	Class hours	Hours outside the classroom	Total hours
Introductory activities	1	1	2
Lecturing	18	37	55
Problem solving	29	37	66
Autonomous problem solving	2	10	12
Essay questions exam	2.5	12.5	15

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

Methodologies

	Description
Introductory activities	Activities directed to take contact and gather information on the students, as well as to present the subject.
Lecturing	Exposition of the contents of the subject. It will be illustrated with numerous examples and applications.
Problem solving	Approach, analysis, resolution and debate of a problem or exercise related with the subject, given to illustrate and complete the explanation of each lesson.
Autonomous problem solving	It will be proposed exercises and problems that the students have to resolve in group by using collaborative learning as a integrated methodology.

Personalized assistance

Methodologies	Description
Introductory activities	Attention and resolution of doubts to the students in relation to the different activities of the matter.
Lecturing	Attention and resolution of doubts to the students in relation to the different activities of the matter.
Problem solving	Attention and resolution of doubts to the students in relation to the different activities of the matter.
Autonomous problem solving	Attention and resolution of doubts to the students in relation to the different activities of the matter.

Tests	Description
Essay questions exam	Before the realisation of the exam, attention and resolution of doubts to the students in relation to the different activities of the matter.

Assessment

	Qualification	Training and Learning Results		
Autonomous problem solving	The resolution of problems will be included in the partial and final exams.	30	A1	B2
			C1	D3
			C32	D4
				D5
				D8
Essay questions exam	Final exam about all the subject. Length: 2. 5 hours	70	A1	B2
			C1	D3
			C32	D4
				D5
				D8

Other comments on the Evaluation

CRITERIA OF EVALUATION FOR THE FIRST AVALIATION PERIOD

If a student no presents it any of the exams, a qualification of 0 will be assigned.

P1: Mark of the first partial (over 10); P2: Mark of the final exam (over 10).

In the case to achieve at least a 4 in the final examination, the qualification will be:

$$\max (P2, 0.3*P1 + 0.7*P2)$$

In the case of not achieving a minimum a 4 in the final examination, the qualification will be:

me(4, 0.3**P1 + 0.7**P2)

CRITERIA OF EVALUATION FOR THE SECOND AVALIATION PERIOD

The final mark will be determinated by an exam about all the subject.

EXAM DATES

Continuous assessment tests will be carried out during teaching hours.

The calendar of exams officially approved by the centre will be published in the webpage

http://aero.uvigo.es/*gl/*docencia/examinations

Sources of information

Basic Bibliography

Grossman, S. I., **Álgebra lineal**, 7^a, S.A. Mc Graw Hill, 2012

Hernández, E., **Álgebra y Geometría**, 3^a, Addison-Wesley, 2012

Lay, D. C., **Álgebra lineal y sus aplicaciones**, 4^a ed, Pearson, 2012

Merino, L.; Santos, E., **Álgebra Lineal con métodos elementales**, 1^a ed, Paraninfo, 2006

Complementary Bibliography

Burgos, Juan de, **Álgebra lineal y geometría cartesiana**, 3^a ed, S.A. Mc Graw Hill, 2006

Castellet, M. ; Llerena, I., **Álgebra Lineal y Geometría**, 1^a ed, Reverté, 1991

Lipschutz, S., **Álgebra Lineal**, 2^a ed, S.A. Mc Graw Hill, 1992

Baker, R.; Kuttler, K., **Linear algebra with applications**, 1st ed, World Scientific, 2014

Recommendations

Contingency plan

Description

IF THE TEACHING IS SEMI PRESENCIAL:

Theoretical Part: The topics will be included in the Moovi platform.

Practical part: The exercises will be proposed and the students will solve them through the Moovi platform.

Assistance: Through email and Campus Remoto.

Evaluation: Presencial if possible. Otherwise online through Campus Remoto.

IF THE TEACHING IS NON-PRESENCIAL:

Theoretical Part: The topics will be included in the Moovi platform.

Practical part: The exercises will be proposed and the students will solve them through the Moovi platform.

Assistance: Through email and Campus Remoto.

Evaluation: Presencial if possible. Otherwise online through Campus Remoto.

IDENTIFYING DATA

Physics: Physics I

Subject	Physics: Physics I			
Code	O07G410V01103			
Study programme	Grado en Ingeniería Aeroespacial			
Descriptors	ECTS Credits 6	Choose Basic education	Year 1st	Quadmester 1st
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Lorenzo Gonzalez, Maria de las Nieves			
Lecturers	Cabrera Crespo, Alejandro Jacobo Lorenzo Gonzalez, Maria de las Nieves			
E-mail	nlorenzo@uvigo.es			
Web	http://aero.uvigo.es/			
General description	This course will provide the fundamental basis of mechanics, in particular, classical mechanics. Mechanics is the branch of the Physics focused on the study of the behaviour of bodies at rest or moving bodies. During the course of Physics I, the basis of classical mechanics will be studied, which will be extended in the next year in the course of Classical Mechanics. Both basics of the kinematics and the dynamics will be addressed in this Physics I. The kinematics is devoted to study the movement of the bodies, without considering the causes of that movement. That is, the kinematics gives answer to the question of How does a body move?. On the other hand, the dynamics is devoted to study the causes of the movement of the bodies and its evolution. That is, the dynamics, unlike the kinematics, gives answer to the question Why is this body moving? This course is fundamental since the principles of the phenomena related with the behaviour of the bodies (at rest or moving bodies) are based on this course. English Friendly subject: International students may request from the teachers: a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Skills

Code

A1	That the students demonstrate to possess and understand knowledge in an area of study that is part of the general education (second level), and often found at a level that, although based on advanced textbooks, also includes some aspects that involve knowledge from the avant-garde of the field of study
B2	Planning, documentation, project management, calculation and manufacturing in the field of aeronautical engineering (in accordance with what is established in section 5 of order CIN / 308/2009), aerospace vehicles, propulsion systems, aerospace materials, airport infrastructures, air navigation infrastructures and space management, air traffic and transport management systems.
C2	Understanding and mastery of the basic concepts about the general laws of mechanics, thermodynamics, fields and waves and electromagnetism and their application to solve problems related to engineering.
D1	Capability of analysis, organization and planification.
D3	Capability of oral and written communication in native language
D4	Capability of autonomous learning and information management
D5	Capability to solve problems and draw decisions
D6	Capabiility for interpersonal communication
D8	Capabiility for critical and self-critical reasoning

Learning outcomes

Expected results from this subject

Training and Learning Results

Knowledge and understanding of the basic principles of physics and their application to the analysis and resolution of engineering problems.	A1	C2	D1 D3 D5 D8
Knowledge, understanding and application of the general laws of the Classical Mechanics, with special upsetting in the relative movements, the cinematic and dynamics of the point, the theorems of the quantity of movement and of the moment kinetical, and the cinematic, static and dynamics of the rigid solid.	B2	C2	D4 D5 D6

Contents

Topic

1) Basic vectorial Calculus	- Vectors and scalars - Coordinate system
2) Kinematics	- Reference system, trajectories, velocity and acceleration - Rectilinear and curvilinear motion - Tangential and normal accelerations
3) Relative movement	- Translation - Rotation - Components of the acceleration
4) Newton's laws	- Force - Newton's first law □ inertia - Newton's second law □ weight - Newton's third law □ action-reaction - Linear momentum - Angular momentum - Work and energy
5) Particle system	- External and internal forces - Linear impulse. Collisions - Centre of mass. - Linear momentum, angular momentum, work and energy of a particle system
6) Rigid solids	- Concept of rig solid. Centre of mass - Moment of inertia - Translation - Rotation around a fixed axis - Rolling motion
7) Particle statics and rigid solid statics	- General equations of the equilibrium of rigid solid - System of forces - Stability
8) Fluid statics	- Density and hydrostatic pressure - Archimedes□ principle - Surface tension. Capillarity

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	32	64	96
Autonomous problem solving	4	6.5	10.5
Research based methodologies	2	4	6
Programmed instruction	0	6	6
Laboratory practical	12	0	12
Essay questions exam	2.5	0	2.5
Report of practices, practicum and external practices	0	5	5
Problem and/or exercise solving	0	12	12

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

Methodologies

	Description
Lecturing	The theory of the course will be presented and it will be applied to solve problems
Autonomous problem solving	The student should solve exercises following some instructions.
Research based methodologies	Improves information processing in specific domains by using scientific research activities.
Programmed instruction	It consists of the presentation of a matter divided into several teaching units, of smaller size, with issues at the end of each teaching unit in order to strengthen the acquired knowledge. These activities can be performed in person or virtually.
Laboratory practical	Tasks related with the contents of the course will be carried out in the laboratory. The realisation of these tasks is mandatory to pass the course

Personalized assistance

Methodologies	Description
Laboratory practical	During the tasks in the laboratory, a personal follow-up will be carried out to guide the students to achieve the objectives
Research based methodologies	Tutoring sessions will be scheduled to solve any doubt of the students

Assessment		Description	Qualification	Training and Learning Results	
Research based methodologies	Students will present the results of their research. The maximum marks of this part will be 10% of the final total marks. (Optional)		10	D3 D4 D6	
Laboratory practical	In order to pass the course, laboratory tasks should be carried out. Continuous assessment will be used during the realisation of the tasks. The maximum marks of this part will be 15% of the final total marks. (Mandatory)		15	A1	C2 D1 D3 D4 D6 D8
Essay questions exam	There will be an exam that include questions and exercises. The maximum marks of this part will be 60% of the final total marks. However, a minimum of 5 over 10 has to be reached in the exam to pass the course. (Mandatory)		60	B2 C2	D4 D5
Problem and/or exercise solving	The maximum marks of this part will be 15% of the final total marks. (Optional)		15		C2 D6

Other comments on the Evaluation

Assessment system in second call will be the same as explained before. Marks achieved in Laboratory, research based methodologies and Troubleshooting can be saved. Laboratory tasks should have been carried out in order to attend the second call.

Dates of evaluation:

the official dates can be found in

<http://aero.uvigo.es/gl/docencia/exames>

Off-site students should notify the situation to the coordinator of the course. In this case the maximum marks of the exam will be 85% of the final total marks and 15% will correspond to laboratory.

In summary:

Assessment of on-site students:

- Exam up to 60% (a minimum of 5 over 10 has to be reached in the exam to pass the course)
- Troubleshooting up to 15%
- Research based methodologies up to 10%
- Laboratory tasks up to 15% (mandatory)

Evaluation for students who do not choose a continuous assessment.

- Exam up to 85% (a minimum of 5 over 10 has to be reached in the exam to pass the course).
- Laboratory tasks up to 15% (mandatory)

VERY IMPORTANT:

A minimum of 5 over 10 has to be reached in the exam to pass the course. In the case that the mark of 5 (over 10) is not reached in the exam, the mark that will appear in the record will be the mark of that exam. The duration of the exam will be approximately 2.5 hours.

Off-site students that do not pass in the first call can attend the assessment in second call by solving one unique exam with questions regarding all contents of the course (whenever they have done the laboratory practices)

In special cases, where for justified and previously notified reasons, the students can not attend the practices, or participate in continuous assessment. The 100% of the evaluation will correspond to a final exam in which all the competences of the course will be evaluated.

Plagiarism is regarded as serious dishonest behavior. If any form of plagiarism is detected in any of the tests or exams, the final grade will be FAIL (0), and the incident will be reported to the corresponding academic authorities for prosecution.

Sources of information

Basic Bibliography

Sears-Zemansky, **Física Universitaria Volumen I**, 12^a, Addison-Wesley, 2009

Alcaraz i Sendra O., López López J., López Solana Vicente, **Física. Problemas y ejercicios resueltos**, 1^a, Pearson Prentice Hall, 2006

Complementary Bibliography

Serway R.A., Jewett J.W., **Física para ciencias e ingeniería**, 7^a, Cengage Learning, 2008

Tipler, Paul Allen, **Física**, 5^a, Reverte, 2003

Ferdinand P. Beer ; E. Russell Johnston, Jr. ; Elíot R. Eisenberg, **Mecánica vectorial para ingenieros (Estática)**, 8^a, McGraw-Hill Interamericana, 2007

Ferdinand P. Beer ; E. Russell Johnston, Jr. ; Phillip J. Cornwell, **Mecánica vectorial para ingenieros (Dinámica)**, 9^a, McGraw-Hill Interamericana, 2010

Burbano de Ercilla, Santiago, Burbano García, Enrique y Carlos Gracia Muñoz, **Problemas de Física**, 27^a, Tébar, 2006

Hugh D. Young, Roger A. Freedman, **Sears and Zemansky's university physics : with modern physics**, 13^a, Addison-Wesley, 2012

Recommendations

Subjects that continue the syllabus

Physics: Physics II/O07G410V01202

Subjects that are recommended to be taken simultaneously

Mathematics: Linear algebra/O07G410V01102

Mathematics: Calculus I/O07G410V01101

Contingency plan

Description

The laboratory of physics in modality mist will include face-to-face work in the laboratory and work out of the laboratory covering the total of hours of work of the student defined initially.

Some sessions of the laboratory will substitute by individual exercise owners. That is to say, the professor employing the use of Remote Campus will send all the necessary instructions to explain how to make several practices of physics at home.

These instructions will include a list detailed of the material (that it can find home-like spherical objects, rope, chronometer of the mobile, meter or metric strip, etc.) and all the steps for the taking of data, as well as clear indications of the calculations that have to make and how to have to express the final results with his uncertainties.

The number of sessions of the laboratory that will substitute by these home-made practices will have to determine to take into account the norms of security imposed at this moment (distances of security, maximum capacity of people in the laboratories, etc) and the number of students by group (HC).

The evaluation of the practices (15% of the final note) will base on the work in the laboratory and the delivery of a final memory including methodology, data, and final results.

In the case of the impossibility of realization of face-to-face proofs, these will be made through the telematic platforms of the University of Vigo.

The tutoring sessions may be carried out by telematic means (email, videoconference, forums, ...) under the pre-concerted modality.

IDENTIFYING DATA

Computer science

Subject	Computer science			
Code	007G410V01104			
Study programme	Grado en Ingeniería Aeroespacial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	García Lourenco, Analia María			
Lecturers	García Lourenco, Analia María			
E-mail	analia@uvigo.es			
Web	http://moovi.uvigo.gal			
General description	In this subject, the basic computer contents and introduction to the programming for graduates in Aerospace Engineering. English Friendly subject: International students may request from the teachers: a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Skills

Code

A1	That the students demonstrate to possess and understand knowledge in an area of study that is part of the general education (second level), and often found at a level that, although based on advanced textbooks, also includes some aspects that involve knowledge from the avant-garde of the field of study
C3	Basic knowledge about use and programming of computers, operating systems, databases and software with application in engineering.
D1	Capability of analysis, organization and planification.
D2	Leadership, initiative and entrepreneurship
D3	Capability of oral and written communication in native language
D4	Capability of autonomous learning and information management
D5	Capability to solve problems and draw decisions
D6	Capabiility for interpersonal communication
D8	Capabiility for critical and self-critical reasoning
D9	Capability to work in interdisciplinary teams

Learning outcomes

Expected results from this subject	Training and Learning Results		
Knowledge, comprehension and application of the basic programming techniques and their use in the resolution of numerical problems in engineering.	A1	C3	D4 D5 D9
Knowledge, understanding and application of programming methodologies (data and basic operations, modular programming, input-output operations, etc.).	A1	C3	D1 D2 D4 D5 D6 D8 D9
Basic knowledge about operating systems and programming languages, mainly oriented to the formulation and implementation of specific numerical methods in engineering.	A1	C3	D1 D3 D4 D5 D9

Contents

Topic

Introduction to computing	Hardware: basic components Basic concepts of software Operating systems Collaborative tools Computer security Computer networks / big data
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Conceptos de programación básicos	Types of programming languages: low and high level Variables Functions Flow control Input / Output
Advanced programming concepts	Advanced data types Exceptions Object-oriented programming
Programming being oriented to numerical models used in engineering	Mathematical libraries Parallel calculation Graphical representation

Planning			
	Class hours	Hours outside the classroom	Total hours
Introductory activities	0.5	0	0.5
Lecturing	23	46	69
Practices through ICT	20	40	60
Laboratory practical	4.5	5.5	10
Problem solving	2	6	8
Essay questions exam	2.5	0	2.5

*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	Presentation of the subject: objectives, competences to be acquired by the student, contents, evaluation system. Building of work groups.
Lecturing	Presentation by the teacher of the contents of the course, theoretical bases and/or guidelines of the works, exercises or projects to be developed by the student.
Practices through ICT	Resolution of exercises formulated in the practical sessions, starting with the knowledge as worked in class.
Laboratory practical	Development of programs and documents in which the students reflect the characteristics of their works carried out. The students should describe the tasks and procedures they developed, show the results and observations they carried out, as well as the analysis and processing of data.
Problem solving	Evaluation tests that include theoretical questions or theoretical exercises to solve. The students must respond to the activity formulated and apply the theoretical and practical knowledge of the subject autonomously.

Personalized assistance	
Methodologies	Description
Practices through ICT	The students will have a continuous follow-up and a personalized attention through classes dedicated to the resolution of exercises and the control of the works carried out. They may also attend, if they wish, personalized office hours.

Assessment					
	Description	Qualification	Training and Learning Results		
Practices through ICT	Attendance and active participation	5	A1	C3	D3 D4 D5 D8
Laboratory practical	Development of programs and documents in which the students reflect the characteristics of their works carried out. The students should describe the tasks and procedures they developed, show the results and observations they carried out, as well as the analysis and processing of data.	65	A1	C3	D1 D3 D4 D5 D6 D8 D9

Problem solving	Evaluation tests that include theoretical questions or theoretical exercises to solve. The students must respond to the activity formulated and apply the theoretical and practical knowledge of the subject autonomously.	20	A1	C3	D3 D4 D5 D8
Essay questions exam	Evaluation tests that include activities and problems or practical exercises to solve. The students must respond to the activity formulated and apply the theoretical and practical knowledge of the subject autonomously.	10	A1	C3	D3 D4 D5 D8

Other comments on the Evaluation

Additional information for the evaluation:

The evaluation is the same for both editions of records, the grades corresponding to the solutions of problems and/or exercises are kept.

Non-attending students to classes can take an exam in both the first and second edition of records that covers 100% of the final grade.

Evaluation dates: the exam calendar is published on the web <http://aero.uvigo.es/gl/docencia/exames>.

Sources of information

Basic Bibliography

Bahit, Eugenia, **Curso Python para Principiantes**, Buenos Aires : Safe Creative, 2012

González Duque, Raúl, **Python para todos**, Creative Commons, 2008

Summerfield, Mark, **Python 3**, Anaya, 2009

Guttag, John V., **Introduction to computation and programming using Python**, MIT Press, 2013

Complementary Bibliography

Recommendations

Other comments

RECOMMENDATIONS

Guidelines for the study:

- Attend classes.
- Do the exercises in the practices.
- Review the bibliography and resources presented in class.

Proposals for improvement and recovery:

- Students who have problems in following the pace of learning of the subject should attend the tutorials with the teachers and extend the time dedicated to independent and autonomous learning.

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 in distance 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.

Alternative scenario: Non-classroom teaching

Due to the exceptional situation, given the impossibility of being able to teach in person, virtual means (enabled by the University of Vigo) will be used to teach the classes.

The practices will be delivered by the students and evaluated using the resources of the teledoaching platform available at the time.

The tutorial sessions may be carried out by telematic means (email, videoconference, rooms / classrooms / virtual offices provided by the University of Vigo).

==== ADAPTATION OF THE METHODOLOGIES ====

The teaching methodologies are kept possibly with some temporal modifications in the planning depending on the actual situation.

There will be no modifications of the contents.

The bibliography might be increased with own material (e.g., guides of work, videos, explanatory texts, resolved problems, etc.) in order to facilitate self-learning.

==== ADAPTATION OF THE EVALUATION ====

The tests are kept with the same weightings.

IDENTIFYING DATA

Expresión gráfica: Expresión gráfica

Subject	Expresión gráfica: Expresión gráfica			
Code	O07G410V01105			
Study programme	Grao en Enxeñaría Aeroespacial			
Descriptors	ECTS Credits 6	Choose Basic education	Year 1	Quadmester 1c
Teaching language	Galego			
Department	Deseño na enxeñaría			
Coordinator	Pérez Vázquez, Manuel			
Lecturers	Pérez Vázquez, Manuel			
E-mail	maperez@uvigo.es			
Web	http://aero.uvigo.es/gl/			
General description	O principal obxectivo da materia é capacitar o estudiantado para a xestión e utilización dos sistemas e técnicas de representación más utilizados pola industria aeroespacial, que están baseados na xeometría, sexa esta: métrica, proxectiva, analítica, descriptiva ou computacional. O coñecemento dos métodos para a creación de formas, as súas propiedades e o seu manexo nos diversos contextos de enxeñaría, tanto no plano como no espazo 3D, require unha capacidade axeitada para a análise, a síntese e a visualización (abstracción e idealización), así como do uso da lingua gráfica. A normalización, necesaria para unha definición completa de formas, componentes, obxectos, equipos ou instalacións nos proxectos, require do coñecemento das normas básicas sobre formatos, liñas, modos de representación, dimensionamento, símbolos ou especificacións xeométricas do produto (GPS). O manexo dalgunha aplicación gráfica actual que facilite a creación en 3D e a conseguinte producción de vistas, a montaxe de componentes, a simulación e movemento, a interactividade entre diferentes arquivos ou o dimensionamento paramétrico, enche este enfoque.			

Competencias

Code

A1	Que os estudiantes demostrasen posuír e comprender coñecementos nunha área de estudio que parte da base da educación secundaria xeral, e adóitase atopar a un nivel que, áinda que se apoia en libros de texto avanzados, inclúe tamén algúns aspectos que implican coñecementos procedentes da vanguarda do seu campo de estudio
C5	Capacidade de visión espacial e coñecemento das técnicas de representación gráfica, tanto por métodos tradicionais de xeometría métrica e xeometría descriptiva, como mediante as aplicacións de deseño asistido por computador.
D1	Capacidade de análise, organización e planificación
D3	Capacidade de comunicación oral e escrita na lingua nativa
D4	Capacidade de aprendizaxe autónoma e xestión da información
D5	Capacidade de resolución de problemas e toma de decisións
D6	Capacidade de comunicación interpersonal
D8	Capacidade de razonamento crítico e autocriticó

Resultados de aprendizaxe

Expected results from this subject

Training and Learning Results

Desenvolvemento da capacidade de análise e interpretación gráfica de enunciados, propiedades e situaciós de diversa índole prantexados en contextos de enxeñaría.	A1	C5	D1 D3 D5 D6
Desenvolvemento da capacidade de abstracción e idealización.	A1	C5	D1 D4 D8
Coñecemento dos principios xerais sobre deseño xeométrico.		C5	D1 D3 D6 D8
Coñecemento das principais ferramentas e técnicas de representación.	A1	C5	D4 D6 D8

Contidos

Topic

TEORÍA

1- Introdución á Normalización	1.1-Gráficos na Enxeñaría para a visualización de datos, a comunicación e a definición formal dos obxectos. 1.2-Linguaxe gráfica e Normalización. Organismos para a normalización. 1.4-Normas básicas para a elaboración de planos: formatos, escalas, liñas, vistas e anotacións. 1.5-Principios xerais de representación. Elección de vistas e cortes. Normativa. 1.6-Sistemas europeo e americano. Adaptación aos sistemas CAD.
2- Curvas planas e as súas aplicacións.	2.1-Cónicas: propiedades, trazados e aplicacións. 2.2-Estudio proxectivo das cónicas 2.3-Curvas de rodadura. Aplicacións. 2.4-Outras curvas: espirais, envolventes, evolutas, etc. Aplicacións. 2.5-Aproximacións poligonais a unha curva plana. 2.6-Curvas alabeadas. Triedro intrínseco. A hélice.
3- Fundamentos e Técnicas dos Sistemas de Representación.	3.1-Fundamentos proxectivos dos sistemas de representación. Tipos de proxección. 3.2-Paso dun sistema a outro. 3.3-Pares, ternas e cuaternas. Invariantes proxectivos. 3.4-Formas proxectivas. Categorías. 3.5-Homoloxía e afinidade. 3.6-Sistema diédrico: operacións básicas, medida de ángulos e distancias. Interseccións. 3.7-Sistema axonométrico directo e indirecto. Tipos de axonometría. Proxección oblicua. 3.8-Sistema de planos acoutados. Aplicacións: topografía, cubertas, trazado de vias.
4- Visualización e representación de formas corpóreas.	4.1-Representación de corpos nos diversos sistemas de representación. 4.2-Operacións específicas para a obtención de vistas nunha determinada dirección, partes vistas e ocultas, interseccións. 4.3- Determinación de verdadeiras magnitudes mediante xiros, abatementos e cambios de plano.
5- Superficies regradas e as súas aplicacións	5.1-Clasificación xeral das superficies. 5.2-Superficies regradas: desenvolvibles e alabeadas. Aplicacións. 5.3-Superficies curvas. A esfera. Geodesia. 5.4-As cuádricas. Aplicacións. 5.5-Interseccións entre superficies. 5.6-Superficies poliédricas. Tipos, características, elementos de simetría e representación. 5.7-Agrupamento de poliedros e compartimentación do espazo.
6- Elementos e Formas de Acotación	6.1-Acotación. Elementos básicos. 6.2-Principios xerais de acotación. Sistemas de referencia. 6.3-Elementos roscados. 6.4-Tipos de acotación. Criterios. 6.5-Normativa básica. 6.6-Acotación funcional. 6.7-Tolerancias dimensionais. Axustes. Casos. 6.8-Tolerancias xeométricas. Especificacións nos debuxos. 6.9-Acabados superficiais. Especificacións.
7- Representación de Elementos Normalizados e Conxuntos	7.1-Representación e utilización de compoñentes normalizados nos mecanismos. Elementos de unión. Elementos de transmisión. Outros. 7.2-Debuxos de conxunto. Características. 7.3-Especificacións nos debuxos de conxunto. 7.4-Lista de pezas. 7.5-O ensamblado 3D no ordenador, establecemento de relacións entre compoñentes, animacións, estudos de movemento e simulacións.
8- Fundamentos de simboloxía e representacións esquemáticas para Enxeñaría	8.1-Símboloxía en Enxeñaría. Iconicidade. 8.2-Representacións esquemáticas. 8.3-Aplicacións: mecánica, electricidade e electrónica. 8.4-Normas.
PRÁCTICAS.	.

1- DESEÑO ASISTIDO POR ORDENADOR	Presentación do programa por parte do profesor o primeiro día. Descripción das principais características e posibilidades da ferramenta. Exercicios orientados ao adestramento e a familiarización cos comandos e funcións fundamentais. Procederase a xeración directa de modelos 3D da que derivarán as vistas e cortes necesarios para a súa definición normalizada en 2D. Finalmente efectúase o ensamblado de compoñentes coas restricciones apropiadas que permiten a animación dos mesmos e a simulación. Ao longo do curso utilizaranse os distintos tipos de cotas (condutoras, conducidas, dependentes de unha ecuación matemática ou dun parámetro, vinculadas, etc.).
2- PRÁCTICAS ORDINARIAS	Comezarase cun repaso das construccíons xeométricas básicas, realizado á man, que necesariamente require de traballo na casa. Cada parte teórica será complementada con exercicios a realizar durante as horas de práctica, nas sucesivas semanas, que o discente debe completar na casa. En paralelo realizarase o adestramento na aplicación e iranse resolvendo exercicios no computador de modo que se capacite ó estudiante para elaborar o traballo final no ordenador.
3- TRABALLO PRÁCTICO (TrP)	Propónese a realización dun traballo práctico (TrP) a realizar durante todo o curso, en grupos de 1-3 alumnos, a modo de pequeno proxecto relacionado con mecanismos habituais do entorno da aeronáutica (conxunto, subconxunto ou grupo de compoñentes que desempeñen algunha función relacionada coa temática aeroespacial), no que se refire á súa definición gráfica. A complexidade pode variar segundo a elección de cada grupo.

Planificación

	Class hours	Hours outside the classroom	Total hours
Actividades introductorias	0	2	2
Lección magistral	25	50	75
Prácticas con apoyo das TIC	24	36	60
Seminario	0	2	2
Resolución de problemas de forma autónoma	0	7.5	7.5
Resolución de problemas e/ou exercicios	2	0	2
Exame de preguntas de desenvolvimento	1	0	1
Exame de preguntas obxectivas	0.5	0	0.5

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

Metodoloxía docente

	Description
Actividades introductorias	Presentación da materia na data establecida polo Centro. Exercicios de repaso e actualización na primeira semana do curso.
Lección magistral	Sesión magistral activa na que cada unidad temática será presentada polo profesor e complementada cos comentarios dos estudiantes, baseados na bibliografía xeral que se facilita e noutra específica que se poda engadir para cada tema particular.
Prácticas con apoyo das TIC	Nas sesións prácticas plantexaranse exercicios a resolver de maneira individual ou colectiva, á man e/ou con ordenador, orientados á aplicación da teoría e a acadar destreza tanto na utilización das ferramentas tradicionais como automatizadas.
Seminario	Para orientación do traballo, integración nos grupos e resolución de dúbidas.
Resolución de problemas de forma autónoma	Exercicios curtos a resolver polo alumno na casa e un traballo a desenvolver durante o curso para entregar a final, consistente nun mecanismo ensamblado.

Atención personalizada

Methodologies	Description
Seminario	Selección do traballo a desenvolver, con guía do profesor
Actividades introductorias	Repaso de cuestións básicas, incluso con algunha clase presencial extra, voluntaria, para os que non cursaran as materias previas no bacharelato.

Avaliación

Description	Qualification	Training and Learning Results

Lección maxistral	Exame ordinario con preguntas de desenvolvemento e exercicios, a realizar na data establecida polo centro, de teoría e práctica, sobre dos contidos tratados nas distintas sesións.	60	A1	C5	D1 D3 D4 D6 D8
Prácticas con apoio das TIC	Avaliación das prácticas realizadas semanalmente, con informes periódicos.	30	A1	C5	D1 D4 D6
Resolución de problemas de forma autónoma	Avaliación dun traballo realizado durante o curso, consistente no deseño de compoñentes, ensamblado dos mesmos e simulación do mecanismo.	10		C5	D1 D3 D4 D5 D8

Other comments on the Evaluation

A avaliación continua incluirá todo o traballo desenvolvido de modo presencial ou non presencial, daquelas actividades individuais e grupais programadas. A asignatura supérase mediante a avaliación continua ó acadar 5,00 puntos en cada unha das 3 partes en que se divide. No caso de non acadar 5,00 en cada parte, a materia tamén pode superarse se en cada parte se supera o 4,5 e a media resulta igual ou superior a 5,00 puntos. No caso de que a media sexa igual ou superior a 5 pero non se chegue ao 4,5 en algúna das partes, a nota que figurará na acta será 4,9.

A mediados do curso realizarase un exame parcial (30% da nota total). A cualificación desta primeira parte será a obtida no exame parcial ou ben na súa recuperación que coincidirá co exame final, no que se realizará tamén o segundo parcial (en data fixada polo centro). A cualificación do segundo parcial será a obtida no exame final desta parte (30% da nota total). O 40% restante da nota total, segundo a metodoxía anteriormente esposta, obterase polas prácticas e traballos realizados durante o curso nas porcentaxes indicadas.

No caso de non seguir o proceso de avaliación continua o alumno poderá presentarse ao exame final da materia, podendo neste caso completarse dito exame co exame das prácticas. A súa cualificación será a obtida en dito exame.

Para a avaliación da segunda oportunidade manteranse as cualificacións das partes superadas anteriormente, debendo recuperarse as non superadas e podendo presentarse tamén ás superadas co obxectivo de mellorar a cualificación final.

Datas avaliación: Segundo o calendario de exames aprobado oficialmente pola Xunta da Escola, que se publica na súa páxina web: <http://aero.uvigo.es/gl/docencia/exames>. A parte práctica, de ser o caso, podería requerir algún tipo de prova ó marxe de tales datas.

Compromiso ético: "Espérase que o estudiantado presente un comportamento ético axeitado. En caso de detectar un comportamento ético non axeitado (copia, plaxio, utilización de aparellos electrónicos non autorizados, e outros) considerarase que o/a alumno/a non reúne os requisitos necesarios para superar a materia. Neste caso a cualificación global no presente curso académico será de suspenso (0.0). No caso de ser necesario, poderase realizar un novo exame para verificar a adquisición de competencias e coñecementos por parte do alumnado implicado."

Bibliografía. Fontes de información

Basic Bibliography

- AENOR, **Normas varias, actualizadas**, Segundo cada norma,
- Félez Mindán, J., **Ingeniería Gráfica y Diseño**, Síntesis D.L., 2008
- Izquierdo Asensi, F., **Geometría Descriptiva Superior y Aplicada**, 6ª, Ed. Dossat, 2013
- Prieto Alberca, M., **Fundamentos Geométricos del Diseño en Ingeniería**, ADI, 1992

Complementary Bibliography

- Félez Mindán, J., **Dibujo Industrial**, 3ª, Ed. Síntesis, 2000
- Izquierdo Asensi, F., **Geometría Descriptiva**, 24ª, Ed. Paraninfo, 2000
- Prieto Alberca, M., **Geometría Aplicada al Diseño**, ADI, 2010
- Company, P.; Vergara, M; Mondragón, S., **Dibujo Indiustrial**, Universitat Jaume I, 2007

Recomendacions

Subjects that continue the syllabus

- Dirección e xestión de proxectos/O07G410V01701

Other comments

A conveniencia de ter cursado as materias de "Debuxo Técnico" no bacharelato de Ciencias e Tecnolóxico como parte

introductoria, para facilitar o proceso de aprendizaxe.

Plan de Continxencias

Description

Dada a incerteza na evolución da alerta sanitaria provocada polo COVID-19, a Universidade estableceu unha planificación extraordinaria que se activará no intre en que as administracións e a propia institución o determinen, en función de criterios de seguridade, saúde e responsabilidade, para garantir o ensino nun marco non presencial ou parcialmente presencial. A previsión destas medidas garante, no intre requerido, o desenvolvemento da docencia dun xeito máis ágil e eficaz, posto que son coñecidas con anterioridade por estudiantes e profesores a través da ferramenta DOCNET.

De acordo coas instrucións recibidas da Vicerreitoría de Ordenación Académica e Docencia, debe contemplarse polo menos un único escenario alternativo, previsto para situacións temporais limitadas por restricións locais derivadas de gromos ou peches na localidade en que se localice o centro docente. Neste caso séguense contemplando os tres escenarios do curso anetrior, enumerados a continuación, cos seus correspondentes niveis de continxencia:

ESCENARIO 1. Modalidade Presencial.

Toda a docencia desenvolverase de xeito presencial, tanto para clases teóricas como prácticas, da forma habitual contemplada na presente guía docente, similar aos cursos previos á pandemia, se ben cada vez se completada máis co emprego das ferramentas TIC.

ESCENARIO 2. Modalidade Semipresencial

No caso da activación por parte das autoridades universitarias desta modalidade de ensino mixto, tal circunstancia suporía unha redución da capacidade dos espazos habitualmente empregados para o ensino na modalidade presencial, para o cal como primeira medida o centro comunicará aos profesores da materia a información relativa á nova capacidade autorizada para os espazos de ensino, de xeito que se poida proceder á reorganización das actividades formativas durante o resto do prazo. Cómpre sinalar que a reorganización a realizar dependerá do intre (durante o semestre) no que se active a devandita modalidade de ensino. A reorganización das ensinanzas efectuarase de acordo coa seguinte guía:

- a) Comunicación. Informarase a todos os estudiantes da materia a través da plataforma MOOVI ou dos medios oportunos das condicións específicas nas que se levarán a cabo as actividades formativas e as restantes probas de avaliación ata rematar o semestre.
- b) Adaptación das titorías e atención persoalizada. As sesións de titoría poderán realizarse por medios telemáticos (correo electrónico, videoconferencia, salas virtuais, foros Moovi, etc.), previa concertación de data e hora, nas oficinas virtuais dos profesores.
- c) Actividades presenciais e non presenciais. Das restantes actividades para rematar o semestre, indicaranse aquelas actividades formativas que poden realizar todos os estudiantes de xeito presencial (priorizando na medida do posible as actividades prácticas) e as actividades de formación que se realizarán de xeito remoto (as clases teóricas son a miúdo as que menos reducen a súa eficiencia con esta modalidade), co propósito de planificar a súa realización efectiva.
- d) Contidos e obxectivos de aprendizaxe. Os contidos e os obxectivos de aprendizaxe non serán modificados como consecuencia deste modo de ensino.
- e) Programación do ensino. Mantéñense os horarios e o calendario das clases e das diferentes actividades da materia.
- f) Bibliografía ou material adicional para facilitar a autoaprendizaxe. O profesorado proporcionará aos estudiantes o material didáctico necesario para satisfacer as necesidades de apoio dos estudiantes para a materia, segundo as circunstancias existentes en cada momento, a través da plataforma Moovi.
- g) Avaliación. De ser preciso o modo non presencial efectuaranse as probas equivalentes aos exames presenciais mediante a plataforma Moodle.

En canto ás ferramentas a empregar nas actividades formativas a desenvolver en modo non presencial, empregaranse as plataformas de Campus Remoto e MOOVI, que se poden complementar con outras solucións para atender necesidades específicas que xurdan ao longo do período.

ESCENARIO 3. Modalidade Non Presencial

No caso de que se active a modalidade de docencia totalmente non presencial (suspensión de todas as actividades de formación e avaliación presenciais), serán prioritarias as plataformas dispoñibles na Universidade de Vigo: Campus Remoto e MOOVI. As condicións da reorganización a realizar dependerán do momento ao longo do semestre no que se active a devandita modalidade docente. Tal reorganización das ensinanzas efectuarase de acordo coa seguinte guía:

- a) Comunicación. Informarase aos estudiantes a través da plataforma Moovi ou dos medios dispoñibles das condicións específicas nas que se levarán a cabo as actividades de formación e as restantes probas de avaliación para rematar o semestre.
- b) Adaptación e/ou modificación de metodoloxías de ensino. A pesar de que as metodoloxías de ensino están fundamentalmente concibidas para a modalidade de docencia presencial, considérase que esencialmente conservan a súa eficiencia nesta modalidade, polo que se propón o seu mantemento prestando especial atención ó seu correcto desenvolvemento.

- c) Adaptación das titorías e atención persoalizada. As sesións de titorías realizaranse por medios telemáticos (correo electrónico, videoconferencia, foros de Moovi, salas virtuais de profesores, etc.). No caso das salas virtuais é necesaria a concertación previa da data e hora.
- d) Contidos a impartir e obxectivos de aprendizaxe. Salvo indicación contraria, non se modificarán os contidos a impartir nin os obxectivos de aprendizaxe como consecuencia desta modalidade docente.
- e) Programación da docencia. Mantéñense os horarios das clases e os calendarios das diferentes actividades.
- f) Avaliación. Non se modifica o número de probas nin as respectivas porcentaxes de puntuación nin as datas de realización das mesmas. Tales probas realizaranse empregando Moovi.
- g) Bibliografía e material adicional para facilitar a auto-aprendizaxe. O profesorado facilitará aos alumnos o material didáctico necesario para atender as necesidades de apoio aos estudiantes na materia, segundo as circunstancias que concorran.
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IDENTIFYING DATA				
Mathematics: Calculus II				
Subject	Mathematics: Calculus II			
Code	O07G410V01201			
Study programme	Grado en Ingeniería Aeroespacial			
Descriptors	ECTS Credits 6	Choose Basic education	Year 1st	Quadmester 2nd
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Cid Iglesias, María Begoña			
Lecturers	Cid Iglesias, María Begoña			
E-mail	bego@dma.uvigo.es			
Web	http://aero.uvigo.es/gl/			
General description	The objective of the subject is that the students know and dominate the basic techniques of the integral calculus, vector calculus, ordinary differential equations and their applications, necessary both for other subjects of the qualifications and the professional exercise.			
	<p>English Friendly subject: International students may request from the teachers:</p> <ul style="list-style-type: none"> a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English. 			
Skills				
Code				
A1	That the students demonstrate to possess and understand knowledge in an area of study that is part of the general education (second level), and often found at a level that, although based on advanced textbooks, also includes some aspects that involve knowledge from the avant-garde of the field of study			
B2	Planning, documentation, project management, calculation and manufacturing in the field of aeronautical engineering (in accordance with what is established in section 5 of order CIN / 308/2009), aerospace vehicles, propulsion systems, aerospace materials, airport infrastructures, air navigation infrastructures and space management, air traffic and transport management systems.			
C1	Capability to solve mathematical problems that may arise in engineering. Aptitude to apply the knowledge about: linear algebra; geometry; differential geometry; differential and integral calculation; differential equations and partial derivatives; numerical methods; numerical algorithm; statistics and optimization.			
C32	Appropriate knowledge applied to engineering: methods of calculation and development of materials and defence systems; management of experimental techniques, equipment and measuring instruments; numerical simulation of the most significant physical-mathematical processes; inspection, quality control and fault detection techniques; their most appropriate methods and repair techniques.			
D1	Capability of analysis, organization and planification.			
D3	Capability of oral and written communication in native language			
D4	Capability of autonomous learning and information management			
D5	Capability to solve problems and draw decisions			
D6	Capabiility for interpersonal communication			
D8	Capabiility for critical and self-critical reasoning			
Learning outcomes				
Expected results from this subject			Training and Learning Results	
Knowledge and understanding of the main concepts and techniques of the integral calculus in several variables.			A1	B2
			C1	D1
			C32	D3
				D4
				D5
				D6
				D8
Knowledge and understanding of the models that adopt the form of ordinary differential equations and the main elementary techniques of integration.			A1	B2
			C1	D1
			C32	D3
				D4
				D5
				D6
				D8

Knowledge, understanding and application of the numerical methods of resolution of the models and typical problems of the aerospace technology; in concrete, polynomial interpolation, numerical differentiation and the resolution of ordinary differential equations.	A1	B2	C1	D1
			C32	D3
				D4
				D5
				D6
				D8

Contents

Topic

Multiple integrals. Fubini's theorem. Change of variable.	Multiple integrals. Fubini's theorem. Change of variable.
Line and surface integrals.	Line and surface integrals.
Gauss' and Stokes' theorems	Gauss' and Stokes' theorems
Introduction to the ordinary differential equations. Existence and uniqueness.	Introduction to the ordinary differential equations. Existence and uniqueness.
Linear systems and systems with constant coefficients.	Linear systems and systems with constant coefficients.
Numerical resolution of ordinary differential equations.	Numerical resolution of ordinary differential equations.
Polynomial interpolation.	Polynomial interpolation.

Planning

	Class hours	Hours outside the classroom	Total hours
Introductory activities	1	1	2
Lecturing	28	56	84
Problem solving	15	15	30
Autonomous problem solving	0	13.5	13.5
Practices through ICT	6	12	18
Essay questions exam	2.5	0	2.5

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

Methodologies

	Description
Introductory activities	Activities to make contact and gather information on the students, and to present the subject.
Lecturing	The professor will present in the theoretical classes the contents of the subject. Students will have basic reference texts for tracking the subject.
Problem solving	The professor will solve problems and exercises manually and the student will have to solve similar exercises to acquire the necessary skills.
Autonomous problem solving	The students will have to solve exercises independently to check the acquisition of the skills.
Practices through ICT	The professor will solve problems and exercises with computer tools and the student will have to solve similar exercises to acquire the necessary skills.

Personalized assistance

Methodologies	Description
Lecturing	The professor will personally solve the doubts of students. The doubts will be solved in-person, specially during problems and laboratory lectures and during tutorials, and also by using the remote options available for the course.
Problem solving	The professor will personally solve the doubts of students. The doubts will be solved in-person, specially during problems and laboratory lectures and during tutorials, and also by using the remote options available for the course.
Autonomous problem solving	The professor will personally solve the doubts of students. The doubts will be solved in-person, specially during problems and laboratory lectures and during tutorials, and also by using the remote options available for the course.

Assessment

	Description	Qualification	Training and Learning Results

Autonomous problem solving	Written tests and / or work to assess will be made to evaluate solving exercises and / or problems autonomously. RA1, RA2, RA3	40	A1	B2	C1 C32	D1 D3 D4 D5 D6 D8
Essay questions exam	A final exam on the contents of all the course will be made. RA1, RA2	60	A1	B2	C1 C32	D1 D3 D4 D5 D6 D8

Other comments on the Evaluation

In case of not attending class in person, mixed or non-face-to-face teaching, in order to be eligible for the evaluation it is essential to upload an updated photo to the platform in order to identify the students.

In any call it is necessary to obtain 5 points to pass the subject. The exam will be scored over 10 points. Since the subject has two different parts, it will be necessary to have a minimum of 2 points out of 5 in each part. In the case of obtaining a grade lower than 2 points in any of the parts, the final grade that will appear in the record will be the sum of both notes limiting it to a maximum of 4.8 points. (*)

The maximum duration of any exam will be 3 hours. **Second chance evaluation (assistants):**

Carrying out an exam in which the learning results and the achievement of the competencies indicated in the teaching guide will be evaluated. This exam will provide 100% of the grade of this call.

In the case of having obtained a minimum of 3 points in one part (and not having reached 2 points in the other part), the student can choose to take only the failed part or the complete exam. The criterion indicated in (*) will also apply.

Evaluation procedure for non-assistants (any call):

Carrying out an exam in which the learning results and the achievement of the competencies indicated in the teaching guide will be evaluated. This exam will provide 100% of the grade of this call. The criterion indicated in (*) will also apply.

Dates evaluation: The evaluation schedule officially approved by the EEA is published on the website <http://aero.uvigo.es/es/docencia/examenes/>

Ethical commitment:

It is expected that the students present a suitable ethical behaviour. In case to detect an ethical behaviour no suitable (copy, plagiarism, utilisation of electronic devices non authorised, and others) will consider that the student does not gather the necessary requirements to surpass the subject. In this case the global qualification in the present academic course will be of suspense (0.0).

It remembers the prohibition of the use of mobile devices or portable computers in exercises and practical since the Royal decree 1791/2010, of 30 December, by which approves the Statute of the University Student, establishes in his article 13.2.d), relative to the duties of the university students, the duty of :

"Abstain of the utilisation or cooperation in fraudulent procedures in the proofs of evaluation, in the works that realise or in official documents of the university".

Sources of information

Basic Bibliography

E. Marsden, A.J. Tromba, **Cálculo Vectorial**, Pearson, 2004

R. Larson, B.H. Edwards, **Cálculo 2 de varias variables**, 10^a, McGraw-Hill, 2016

G.F. Simmons, **Ecuaciones Diferenciales con aplicaciones y notas históricas**, McGraw-Hill, 1993

Complementary Bibliography

A. García et al., **Cálculo II**, CLAGSA, 2002

D.G. Zill, **Ecuaciones diferenciales con aplicaciones de modelado**, 9^a, International Thomson Edit., 2009

A. García et al., **Ecuaciones diferenciales ordinarias**, CLAGSA, 2006

D. Kincaid, W. Cheney, **Análisis numérico: las matemáticas del cálculo científico**, Addison-Wesley Iberoamericana, 1994

Recommendations

Subjects that continue the syllabus

Mathematics: Mathematical methods/O07G410V01301

Subjects that are recommended to be taken simultaneously

Physics: Physics II/O07G410V01202

Subjects that it is recommended to have taken before

Physics: Physics I/O07G410V01103

Mathematics: Linear algebra/O07G410V01102

Mathematics: Calculus I/O07G410V01101

Other comments

It is recommended attend to class and work the contents weekly.

Contingency plan**Description**

In the event of exceptional circumstances:

Elearning platforms/tools

Online tuition will be supported by Campus Remoto and Moovi. Other supplementary platforms may be used to guarantee the accessibility to teaching content.

Tutoring sessions

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

Assessment

Exams will be face-to-face unless academic authorities indicate otherwise. In any case, all the comments included in the Assessment section remain valid.

IDENTIFYING DATA

Physics: Physics II

Subject	Physics: Physics II			
Code	O07G410V01202			
Study programme	Grado en Ingeniería Aeroespacial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Salgueiro Piñeiro, Jose Ramon			
Lecturers	Michinel Alvarez, Humberto Javier Salgueiro Piñeiro, Jose Ramon			
E-mail	jrs@uvigo.es			
Web	http://aero.uvigo.es			
General description	The matter of Physics II is fundamentally oriented to provide the training and basic competences on the basic electromagnetism, including its main theoretical practical aspects.			
	English Friendly subject: International students may request from the teachers: a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Skills

Code

- A1 That the students demonstrate to possess and understand knowledge in an area of study that is part of the general education (second level), and often found at a level that, although based on advanced textbooks, also includes some aspects that involve knowledge from the avant-garde of the field of study
- B2 Planning, documentation, project management, calculation and manufacturing in the field of aeronautical engineering (in accordance with what is established in section 5 of order CIN / 308/2009), aerospace vehicles, propulsion systems, aerospace materials, airport infrastructures, air navigation infrastructures and space management, air traffic and transport management systems.
- C2 Understanding and mastery of the basic concepts about the general laws of mechanics, thermodynamics, fields and waves and electromagnetism and their application to solve problems related to engineering.
- D1 Capability of analysis, organization and planification.
- D3 Capability of oral and written communication in native language
- D4 Capability of autonomous learning and information management
- D5 Capability to solve problems and draw decisions
- D6 Capability for interpersonal communication
- D8 Capability for critical and self-critical reasoning

Learning outcomes

Expected results from this subject

Training and Learning Results

Knowledge and understanding of the basic principles of Physics and their application to the analysis and to the resolution of problems in engineering	A1	B2	C2	D1
				D3
				D4
				D5
				D6
				D8
Knowledge, understanding and application of the principles of electromagnetism, including electrostatics, magnetostatics and Maxwell's equations.	A1	C2	D5	D8
Knowledge, understanding and application of the general laws of classical Thermodynamics, introducing the concept of thermodynamic equilibrium and the most important thermodynamic magnitudes.	A1	C2	D5	D8

Contents

Topic

Presentation of the course and historical introduction	Historical introduction.
Scalar and vector fields	Coordinate systems in two and three dimensions. Field concept. Vectorial operators. Gradient of a scalar. Circulation of a vector. Flow. Divergence. Divergence theorem. Rotational. Stokes theorem.

Electrostatics	Charge and charge density. Coulomb's law. Electrostatic field. Flow of the electrostatic field. Gauss' Law. Electrostatic potential. Poisson and Laplace equations. Electrostatic field energy. Potential multipole expansion. Dipoles. Conductors and dielectrics. Electrostatics in presence of matter. Capacitors.
Electrical currents and magnetostatics	Current and current density. Continuity equation. Ohm's law. Conductivity and resistivity. Introduction to the magnetic field. Force between currents. Magnetic induction. Lorentz's force. Biot and Savart's law. Magnetic flux. Ampère's circuital law. Vector potential. Multipolar expansion of vector potential. Magnetic dipoles. Magnetic dipolar moment. Magnetism in presence of matter. Magnetic response of the materials. Magnetic field. Hysteresis cycles.
Electrical circuits	Combination of resistors. Electromotive force. Electrical circuits. Electric power and energy. Voltage and current sources. Measurement of voltages, currents and resistors. Kirchhoff's laws and circuit analysis. Thévenin and Norton theorems.
Introduction to Electrodynamics	Faraday's induction law. Inductance. Generators, motors and transformers. Magnetic energy. Displacement current. Maxwell's equations. Energy and momentum of the electromagnetic field.
Alternating current	Capacitive and inductive reactances. Impedance. Mean and effective power. Complex magnitudes. RLC series and parallel circuits. Resonance. Quality factor. Apparent and reactive power. Transitory states.
Introduction to electromagnetic waves	Types of waves. Energy carried by a wave. Huygens' principle. Superposition of waves of different frequency. Phase and group velocities. Electromagnetic wave equation. Hertz's experiment. Electromagnetic spectrum. Propagation of electromagnetic waves. Electromagnetic energy. Radiometric magnitudes and units. Polarization. Reflection and refraction. Interference and diffraction.
Introduction to thermodynamics. Law zero.	Historical introduction. Fundamental concepts. Thermal equilibrium. Temperature. Temperature measurement: thermometric scales. Types of thermometers.
First law of thermodynamics	Work. Heat concept. Internal energy. Heat capacity. Latent heat.
Second law of thermodynamics	Thermal and freezing machines. Second law statements. Carnot's cycle. Carnot's theorem. Thermodynamic scale of temperatures. Entropy. Entropy increase principle. Third law of thermodynamics. Fundamental equations and state equations.
Ideal gases	Definition of an ideal gas. Status equation. Joule's experiment. Mayer's law. Isocoric, isobaric, isothermic and adiabatic processes for an ideal gas. Slope of isotherms and adiabats.
Laboratory experiences	Measurement of basic electromagnetic properties with multimeter and oscilloscope. Measurement of the capacity of a capacitor. Measurement of Laplace's force. Helmholtz coils. Measurement of the terrestrial magnetic field. Magnetic dipole. Electromagnetic induction. Circuits.

Planning	Class hours	Hours outside the classroom	Total hours
Lecturing	20	40	60
Laboratory practical	12	18	30
Problem solving	7	10.5	17.5
Introductory activities	1	0	1
Seminars	10	15	25
Essay questions exam	2.5	0	2.5
Report of practices, practicum and external practices	0	14	14

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

Methodologies	Description
Lecturing	Classes one hour long to exposed the main theoretical concepts of the matter.
Laboratory practical	Development of experiments in laboratory to illustrate the main theoretical concepts previously developed on the lectures.
Problem solving	Resolution of selected exercises similar to those the student will face later in an autonomous way.
Introductory activities	Presentation of the subject and lecturers. Presentation of the laboratory.
Seminars	Approach, discussion and resolution of questions and problems in relation with the theoretical concepts previously developed in lectures.

Personalized assistance	
Methodologies	Description
Laboratory practical	The lecturer individually explains the development of the experiments to be carried out at the laboratory.
Lecturing	The lecturer individually supervises the correct assimilation of the theoretical concepts developed in the lectures.
Seminars	The lecturer individually supervises resolution of the problems proposed in the seminar lectures.
Introductory activities	Presentation of the subjects at the beginning of the course.
Problem solving	The lecturer solves problems of similar difficulty to those the student will face later in an autonomous way.

Assessment		Description	Qualification	Training and Learning Results		
Essay questions exam	Two control-exams including resolution of problems and questions (that will suppose a total of 20% of the final mark). A final examination that will be 60% of the note. Should the student is not evaluated by means of the control-examination, the final examination will suppose 80% of the mark.		80	A1	C2	D1 D3 D8
Report of practices, practicum and external practices exam.	Delivery and oral presentation if necessary of experiments inform and/or activities realized in the laboratory. The students that do not realize experimental work will be specifically evaluated on these aspects at the final exam.		20	B2	C2	D1 D3 D4 D5 D6 D8

Other comments on the Evaluation	
Continuous assessment exams will be carried out within lecturing time slots.	
The marks of the control-examination can be taken into account at the second call exam. The marks of the laboratory reports can be taken into account at the second call examination as well as the end of program call.	
In the case that the student do not present himself/herself to the control-examinations, the final examination (exam-only assessment) will suppose 80% of the mark and the students that have not attended the laboratory sessions will be evaluated specifically on these aspects the day of the final examination. This applies to the first call exam as well as the second call and end-of-program calls.	
The evaluation dates are on the calendar on the website: http://aero.uvigo.es/gl/docencia/exames === ADAPTATION OF THE EXCEPTIONAL EVALUATION BY THE COVID-19 === If the evaluation can be made presential, the final mark of the student will be the sum of the following qualifications: Control-examination of the two first chapters (electrostatics and magnetostatics). Up to a point. Control-examination of the rest of the subject. Up to a point. Attendance to the laboratory sessions and laboratory report. Up to two points. Exam of the different contents of the subject. Up to six points. In case the evaluation cannot be made presential, the final mark of the student will be the sum of the following qualifications: Online control-examination of the two first chapters (electrostatics and magnetostatics). Up to a point. Online control-examination of the rest of the subject. Up to a point. Attendance to the and works envelope the practices realized in laboratory. Until two points. Attendance to the laboratory sessions and laboratory report. Up to two points. Online examination on all the contents of the subject. Up to four points	

Sources of information	
Basic Bibliography	
Griffiths, D.J, Introduction to electrodynamics , 3 ^a edición, Prentice Hall,	
Burbano de Ercilla, Física General , Mira, Zaragoza,	
Sears, F. W., Salinger, G. L., Termodinámica, teoría cinética y termodinámica estadística , Reverté, 1973	
Complementary Bibliography	
Wangness, R. K., Campos electromagnéticos , Limusa, 1983	
Nilsson, J, Circuitos eléctricos , Addison Wesley Iberoamericana,	
Feynman, R.P. Leighton R.B., Lectures on Physics, Vol II , Addison Wesley Publishing,	
Feynman, R. P., Física (vol. I) , Addison Wesley, 1998	
Cheng, D.K., Fundamentos de electromagnetismo para ingeniería , Addison Wesley Iberoamericana,	
Edminister, J.A., Circuitos Eléctricos , McGraw-Hill,	
Feynman, R.P. Leighton R.B., Sands M., Exercises for the Feynman Lectures on Physics , Addison Wesley Publishing,	

Edminister, J.A., **Electromagnetismo**, McGraw-Hill,
Jackson J.D., **Classical electrodynamics.**, Elsevier, Amsterdam,
Serrano, V, **Electricidad y Magnetismo: Estrategias para la resolución de problemas y aplicaciones**, Prentice Hall,
Sabah, N.H., **Electric circuits and signals**, CRC Press,
Cheng, D.K., **Field and wave electromagnetics**, Addison Wesley Publishing,
Callen, H. B., **Termodinámica: introducción a las teorías físicas de la termostática del equilibrio y de la termodinámica**, AC, 1981
Münster, A., **Classical thermodynamics**, Wiley Interscience, 1970
Varios, <http://wikipedia.org>,

Recommendations

Subjects that are recommended to be taken simultaneously

Mathematics: Calculus II/I007G410V01201

Subjects that it is recommended to have taken before

Physics: Physics I/I007G410V01103

Mathematics: Calculus I/I007G410V01101

Contingency plan

Description

==== PLANNED EXCEPTIONAL MEASURES ===

In view of the uncertain and unpredictable evolution of the health alert caused by the COVID-19, the University of Vigo has established an extraordinary planning that will be activated at the time when the administrations and the institution itself determine it in accordance with safety, health and responsibility criteria, and guaranteeing teaching in a non-presential or partially presential scenario. These measures, already planned, guarantee the development of teaching in a more agile and effective way when they are known beforehand (or well in advance) by students and teachers through the standardized and institutionalized tool of teaching guides.

==== ADAPTATION OF METHODOLOGIES ===

* Teaching methodologies that are maintained

Classes are held in person as long as this is permitted by the regulations in force and it can be guaranteed that the students present maintain the necessary separation distance due to the health situation.

* Teaching methodologies that are modified

Online classes will be given simultaneously with face-to-face teaching to those students who, due to space restrictions, cannot access the face-to-face class.

* Non-attendance mechanism for students (mentoring)

All the mentoring will take place in the "remote campus" enabled by the University of Vigo while the situation of "new normality" lasts. An appointment with the professor will be requested by e-mail. In case the rules of personal distance disappear, the mentoring will be held in the office of the professor of the subject.

* Modifications (if necessary) of the contents to be taught

There are no modifications to the contents, except in the case that the health situation prevents the performance of laboratory practices in a face-to-face manner, in which case the students will be entrusted with tasks to be carried out autonomously in a non-presential manner.

* Additional bibliography to facilitate self-learning

In addition to the existing bibliography in electronic format, the use of wikipedia is recommended for the basic contents of the subject when indicated by the teaching staff.

Some contents of the course can be followed remotely for free on the following websites:

<https://www.edx.org/course/subject/physics>

<https://ocw.mit.edu/courses/physics/>

<https://www.coursera.org/courses?query=physics>

The notes made by the teachers of the subject will be made available to the student in Moovi.

* Other modifications

==== ADAPTATION OF THE EVALUATION ===

If the evaluation can be done in person, the student's final grade will be the sum of the following grades:

Control exam of the first two chapters (electrostatics and magnetostatics). Up to 1 point.

Control exam of the rest of the course. Up to 1 point

Assistance and work on the practices carried out in the laboratory. Up to 2 points.

Examination of all the contents of the subject. Up to 6 points

If the evaluation cannot be made in person, the student's final grade will be the sum of the following grades:

Online control test of the first two chapters (electrostatics and magnetostatics). Up to 1 point.

Online control test of the rest of the course. Up to 1 point

Assistance and work on the practices carried out in the laboratory. Up to 2 points.

Delivery of bulletins of problems solved in an autonomous way. Up to 2 points.

Online examination of all the contents of the subject. Up to 4 points

*Additional information

The performance of laboratory practices in person at the facilities of the University of Vigo on the campus of Ourense will be subject to the restrictions of space that may come given the evolution of the health situation and existing regulations. If it is not possible to carry out all the practices, they will be replaced by non-presential activities that the student can carry out remotely.

Translated with [www.DeepL.com/Translator \(free version\)](https://www.DeepL.com/Translator)

IDENTIFYING DATA

Química: Química

Subject	Química: Química	Choose	Year	Quadmester
Code	007G410V01203			
Study programme	Grao en Enxeñaría Aeroespacial			
Descriptors	ECTS Credits			
	6	Basic education	1	2c
Teaching language	Castelán Galego			
Department	Enxeñaría química			
Coordinator	Alonso González, José Luís			
Lecturers	Alonso González, José Luís Parajó Liñares, Juan Carlos Rivas Siota, Sandra			
E-mail	xluis@uvigo.es			
Web	http://aero.uvigo.es			
General description	Os contidos da asignatura pretenden formar aos alumnos nunha diversidade de aspectos teóricos e aplicados (incluíndo estrutura da materia, termoquímica, disolucions, gases, equilibrio químico, electroquímica, cinética química e química orgánica), que resultan necesarios para abordar con posterioridade outras asignaturas específicas da titulación.			

Competencias

Code

A1	Que os estudantes demostrasen posuír e comprender coñecementos nunha área de estudo que parte da base da educación secundaria xeral, e adóitase atopar a un nivel que, aínda que se apoia en libros de texto avanzados, inclúe tamén algúns aspectos que implican coñecementos procedentes da vanguarda do seu campo de estudo
C4	Capacidade para comprender e aplicar os principios de coñecementos básicos da química xeral, química orgánica e inorgánica e as súas aplicacións na enxeñaría.
D1	Capacidade de análise, organización e planificación
D3	Capacidade de comunicación oral e escrita na lingua nativa
D4	Capacidade de aprendizaxe autónoma e xestión da información
D5	Capacidade de resolución de problemas e toma de decisións
D8	Capacidade de razoamento crítico e autocrítico
D9	Capacidade de traballo en equipo de carácter interdisciplinar
D13	Sustentabilidade e compromiso ambiental. Uso equitativo, responsable e eficiente dos recursos

Resultados de aprendizaxe

Expected results from this subject

Training and Learning Results

Coñecemento, comprensión e aplicación dos principios químicos relacionados coa súa aplicación na enxeñaría	A1	C4	D1
			D3
			D4
			D5
			D8
			D9
			D13
Coñecemento das propiedades químicas más destacadas en relación co comportamento dos materiais	A1	C4	D1
			D3
			D4
			D5
			D8
			D9
			D13

Contidos

Topic

TEMA 1. ASPECTOS XERAIS E CONCEPTOS PREVIOS	1.1 Magnitudes, dimensións, unidades e sistemas de unidades 1.2 Cambios de unidades 1.3 Ecuacións dimensionais e adimensionais 1.4 Modos de expresión da concentración 1.5 Estequiometría e conceptos relacionados
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TEMA 2. O ÁTOMO	2.1 Estructura e partículas constituyentes 2.2 Teoría atómica: orbitales atómicos 2.3 Orbitales atómicos e energía: estructuras atómicas 2.4 Características de los átomos 2.5 Isótopos
TEMA 3. ENLACE COVALENTE	3.1 Natureza do enlace químico 3.2 Teoría de Lewis: estruturas moleculares 3.3 Xeometría molecular 3.4 Teoría de enlace-valencia 3.4 Teoría de orbitales moleculares
TEMA 4. ENLACE IÓNICO	4.1 Íons 4.2 Sólidos iónicos: natureza 4.3 Energía de red 4.4 Propiedades de los sólidos iónicos
TEMA 5. ENLACE METÁLICO	5.1 Sólidos metálicos 5.2 Enlace metálico
TEMA 6. INTERACCIÓNES INTERMOLECULARES	6.1 Natureza das interacciones intermoleculares 6.2 Tipos de interacciones intermoleculares 6.3 Interacciones moleculares e estados de agregación de la materia
TEMA 7. GASES E DISOLUCIONES	7.1 Estado gas: características 7.2 Gases ideales 7.3 Gases reales 7.4 Disoluciones 7.5 Líquidos e disoluciones líquidas 7.6 Propiedades coligativas de las disoluciones
TEMA 8. TERMOQUÍMICA	8.1 Calor, energía interna y entalpía 8.2 Cambios entálpicos asociados a reacciones químicas 8.3 Entropía y energía libre: criterio de evolución espontánea de las reacciones químicas
TEMA 9. EQUILIBRIO QUÍMICO	9.1 Concepto de equilibrio 9.2 Constante de equilibrio 9.3 Tipos de equilibrios 9.4 Cociente de reacción 9.5 Principio de Le Chatelier 9.6 Relaciones termodinámicas
TEMA 10. EQUILIBRIO ÁCIDO-BASE	10.1 Definiciones de ácido y base. 10.2 Autoionización del agua y producto iónico. pH y pOH 10.3 Fortaleza de los ácidos y bases. Cálculo del pH 10.4 Ácidos poliprotónicos 10.5 Hidrólisis 10.6 Disoluciones reguladoras
TEMA 11. EQUILIBRIO DE SOLUBILIDAD	11.1 Compuestos solubles y poco solubles 11.2 Compuestos poco solubles: solubilidad y producto de solubilidad 11.3 Factores que afectan a la solubilidad 11.4 Precipitación fraccionada
TEMA 12. EQUILIBRIO REDOX	12.1 Conceptos básicos de oxidación y reducción 12.2 Reacciones redox: ambiente en medio ácido o básico 12.3 Valoraciones redox
TEMA 13. ELECTROQUÍMICA	13.1 Celas electroquímicas: conceptos básicos 13.2 Potenciais estándar de electrodo y de celda 13.3 Termodinámica de las reacciones electroquímicas 13.4 Ecuación de Nernst. Aplicaciones 13.5 Baterías y pilas 13.6 Procesos industriales de electrólisis 13.7 Corrosión
TEMA 14. CINÉTICA QUÍMICA	14.1 Conceptos básicos: velocidad de reacción 14.2 Factores que modifican la velocidad de una reacción química 14.3 Determinación de la ecuación cinética de una reacción química

TEMA 15. INTRODUCCIÓN Á QUÍMICA ORGÁNICA	15.1 Estrutura dos compostos orgánicos 15.2 Alcanos, alquenos, alquinos e derivados haloxenados dos hidrocarburos 15.3 Hidrocarburos aromáticos 15.4 Alcoholes, fenoles e éteres 15.5 Aldehídos e cetonas 15.6 Ácidos carboxílicos, ésteres e derivados 15.7 Aminas e amidas 15.8 Nitrilos e nitroderivados 15.9 Reacciones dos compostos orgánicos 15.10 A química orgánica na industria aeroespacial
TEMA 16. PETRÓLEO E GAS NATURAL	16.1. Petróleo: definición, composición e refino. 16.2. Gas natural: definición, composición e aplicacións.

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección magistral	24	48	72
Seminario	14	49.5	63.5
Prácticas de laboratorio	12	0	12
Resolución de problemas e/ou exercicios	2	0	2
Exame de preguntas obxectivas	0.5	0	0.5

*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 magistral	Expoñeranse os fundamentos teóricos e prácticos de cada un dos temas da materia, co apoio da bibliografía e materiais audiovisuais. Estimularase a participación do alumnado.
Seminario	De xeito paralelo ás sesións magistrais, nos seminarios abordaranse exercicios relacionados coa materia. O alumno dispoñerá previamente de boletins que inclúan todos os exercicios da materia. Contémplase a posibilidade de que os alumnos resolván de modo autónomo unha parte dos mesmos
Prácticas de laboratorio	Os alumnos realizarán prácticas relacionadas cos contidos da asignatura co obxectivo de que adquiran destrezas relacionadas co manexo de materiais, reactivos e instrumentos habituais nun laboratorio.

Atención personalizada

Methodologies	Description
Seminario	Estimularase a participación en clase, de xeito que os alumnos poidan proponer cuestións para discusión adicional ou resolver exercicios de aplicación ante os seus propios compañeiros
Lección magistral	Procurarase involucrar aos alumnos nas explicacións, dirixíndolles preguntas e permitíndolles suscitar dúbidas, que eventualmente poderían resultar en temas de discusión que os propios alumnos poderían expoñer en clase trala adecuada preparación
Prácticas de laboratorio	Os alumnos contarán con asesoramiento individual para axudarlos no manexo de instrumentos, identificación de problemas de operación, obtención de datos representativos e análise de errores

Avaliación

	Description	Qualification	Training and Learning Results
Lección magistral	Avaliarase, mediante a realización en aula de varios test, a consecución dos resultados de aprendizaxe e as competencias relacionadas cos contidos teóricos da materia vistos en clases de teoría.	10	A1 C4 D1 D4 D5 D8
Seminario	Avaliarase, mediante a resolución en aula de varios problemas, a consecución dos resultados de aprendizaxe e as competencias relacionadas coa aplicación dos conceptos da materia.	10	A1 C4 D1 D3 D4 D5 D8 D9

Prácticas de laboratorio	A realización das prácticas é requisito "sine qua non" para aprobar a materia. Ao finalizar as prácticas realizarase unha proba tipo test ou de preguntas de resposta curta sobre os contidos das mesmas que terá un valor de 5%. Tamén se otorga un valor de 5% á actitude e o traballo durante a estancia no laboratorio.	10	A1	C4	D1 D4 D5 D8 D9 D13
Resolución de problemas e/ou exercicios	Nas datas oficiais farase un exame de resolución de problemas e/ou exercicios da materia, para avaliar a consecución dos resultados de aprendizaxe relacionados coa aplicación a problemas dos conceptos da materia.	40	A1	C4	D1 D3 D4 D5 D8 D9
Exame de preguntas obxectivas	Nas datas oficiais farase un examen tipo test para avaliar os resultados de aprendizaxe relacionados cos contidos teóricos da materia.	30	A1	C4	D1 D4 D5 D8

Other comments on the Evaluation

A) Convocatorias 1^a e 2^a Oportunidade

Con carácter xeral, a avaliación da materia será continua e a calificación final se determinará de acordo coa siguiente ponderación:

exames de teoría, 30%; exames de problemas, 40%; prácticas de laboratorio, 10%; test en aula, 10%; problemas en aula, 10%

Prácticas de laboratorio

De forma xeral, a realización das prácticas de laboratorio dunha maneira satisfactoria é requisito indispensable para superar a materia. Por outra parte, se realizará un exame tipo cuestionario, para o cal se fixará unha convocatoria específica. A calificación das prácticas dependerá da labor experimental realizada no laboratorio e da nota obtida no cuestionario. Esta nota quedará consolidada para a 2^a oportunidade. Os alumnos que fixeron as prácticas en cursos anteriores conservarán a nota conseguida no seu momento.

Entregas de aula

A lo largo del curso, se organizará la realización de 4 entregas: 2 relativas a la parte A (Temas 1-8) y 2 relativas a la parte B (Temas 9-15). Cada entrega tendrá una duración de 1 hora y consistirá en 1 cuestionario de 10 preguntas tipo test y 2 problemas. Todas estas entregas se realizarán en el aula habitual y en horario de clase. La nota de las entregas quedará consolidada para la segunda oportunidad.

Examen parcial

Al finalizar la parte A de la materia (Temas 1-8) se realizará un examen parcial, que es opcional. Se considerará que el parcial está aprobado cuando se obtiene como mínimo un 3.5/10 en teoría y un 3.5/10 en problemas y 5 en el resultado de aplicar la ecuación:

Nota parcial A=nota teoría*0.40+ nota problemas*0.60.

Aquellos alumnos que superen el parcial tendrán que examinarse solamente la Parte B en las fechas oficiales establecidas para los exámenes de 1^a y 2^a oportunidad.

Cálculo de nota final e restricciones

La nota final de la materia será el resultado de aplicar la siguiente ecuación:

Nota final=Nota teoría*0.30+Nota problemas*0.40+Tests en aula*0.10+Problemas en aula*0.10+Prácticas*0.10

Para superar la materia debe obtenerse una nota igual o superior a 5. Sin embargo, en los casos en los que el resultado de aplicar la ecuación anterior iguale o supere el valor de 5, pero no se cumpla el requisito de las notas mínimas antes citado (3.5/10 puntos en teoría y 3.5/10 puntos en problemas), la nota en actas será 4.9 (suspenso).

B) Convocatoria Fin de Carrera e modalidade non presencial

Aquellos alumnos con responsabilidades laborales o situación personal excepcional podrán solicitar al coordinador de la materia (siempre antes del 31 de marzo) ser evaluados mediante una evaluación única (modalidad no presencial). Para ello,

deberán acreditar a devandita situación. Nestes casos, a nota final da materia se calculará da seguinte forma:

Nota final=Nota teoría*0.40+Nota problemas*0.60

Para superar a materia ha de obterse unha nota igual ou superior a 5. Sin embargo, nos casos nos que o resultado de aplicar a ecuación anterior iguale ou supere o valor de 5, pero non se cumpla o requisito das notas mínimas antes citado (3.5/10 puntos en teoría e 3.5/10 puntos en problemas), a nota en actas será 4.9 (suspenso).

Para a convocatoria de Fin de Carrera, a avaliación se realizará mediante un exame teoría e un exame de problemas e a nota se calculará de maneira idéntica á descrita para alumnos en modalidad non presencial.

As datas dos exames serán as publicadas no taboleiro de anuncios e/ou na web do Centro. O exames realizaranse de forma presencial, salvo que a U. de Vigo decida o contrario.

Bibliografía. Fontes de información

Basic Bibliography

Petrucci, R. H., Herring, F.G., Madura, J.D., Bissonnette, C, **Fundamentos de Química**, 10,

M. A. Domínguez, **Problemas resueltos de química. La ciencia básica**, Paraninfo, 2007

J. A. López Cancio, **Problemas de Química**, Prentice Hall, 2000

Chang, R., **Química**, 11,

Complementary Bibliography

Atkins, P.; Jones, L., **Química**, 2,

E. Quiñoá Cabana, **Nomenclatura y formulación de los compuestos inorgánicos**, 2,

Herrero Villén, M.A., Atienza Boronat, J.A., Nogera Murray, P.; Tortajada Genaro, L.A., **La Química en problemas. Un enfoque práctico**, 1,

Llorens Molina, J.A., **Ejercicios para la introducción a la Química Orgánica**, 1,

Sánchez Coronilla, A., **Resolución de Problemas de Química**, 1,

Recomendacións

Subjects that are recommended to be taken simultaneously

Física: Física II/O07G410V01202

Matemáticas: Cálculo II/O07G410V01201

Subjects that it is recommended to have taken before

Física: Física I/O07G410V01103

Matemáticas: Cálculo I/O07G410V01101

Other comments

Os alumnos que cursaron a Química de segundo de Bacharelato teñen unha formación moito más adecuada que os que non o fixeron. Por tanto, estes últimos deberán realizar un esforzo adicional para porse ao nivel dos primeiros.

Recoméndase, en todo caso, revisar aspectos como cambios de unidades, formulación en química inorgánica, concepto de peso molecular e mol, axuste de reaccións químicas e cálculos estequiométricos con e sin reactivo limitante.

Plan de Continxencias

Description

1. MODALIDADE MIXTA

1.1. ADAPTACIÓN DAS METODOLOXÍAS

1.1.1. SESIÓN MAXISTRAL.

As clases impartiránse se é posible en modo presencial e en quenda de mañán empregando aulas con capacidade suficiente para todos os alumnos. Se isto non fora viable, impartiránse en horario habitual (mañán) e empregando os recursos do campus remoto de maneira que parte dos alumnos estarán na aula e parte nos seus domicilios. Para este fin, empregaránse as presentacións en PowerPoint e unha tableta dixitalizadora como elemento de apoio para calquera aclaración.

1.1.2. SEMINARIOS

Os seminarios impartiránse se é posible en modo presencial e en quenda de mañán empregando aulas con capacidade suficiente para todos os alumnos. Se isto non fora viable, se impartirán en horario habitual e empregando os recursos do campus remoto de maneira que parte dos grupos estarán no aula e parte nos seus domicilios. As entregas de aula (problemas e cuestionarios) faránse sempre en aula mantendo as medidas anticovid.

1.1.3. PRÁCTICAS DE LABORATORIO

Ante a imposibilidade de levar a cabo as prácticas de laboratorio de forma individual (só poderían estar 6 alumnos á vez), éstas se farán a modo de demostración nun aula grande e con participación (por turnos) dos alumnos nas tarefas. O traballo completarase co tratamiento de datos e a realización dunha proba consistente nun cuestionario de preguntas de resposta curta ou tipo test.

1.2. AVALIACIÓN

1.2.1. FIN DE CARREIRA: A avaliación en modalidade mixta será igual á da modalidade presencial e os exames se farán en aula.

1.2.2. FIN DE CUATRIMESTRE: A avaliación de fin de cuatrimestre en modalidade mixta será igual á da modalidade presencial e os exames se farán en aula.

1.2.3. SEGUNDA OPORTUNIDADE. A avaliación de segunda oportunidade en modalidade mixta será igual á da modalidade presencial e os exames se fará en aula.

1.3. TITORÍAS

As titorías relativas á docencia das clases tipo A (teoría) e B (seminario) realizaránse nos despachos virtuais do Profesor José Luis Alonso (despacho 53) e da Profesora Sandra Rivas (despacho virtual 2160) a través do campus remoto en horario de titorías e pedindo cita previa a través do correo electrónico. As titorías relativa ás prácticas (horas tipo C) seguirán o mesmo procedemento empregando o despacho virtual do Prof. Juan Carlos Parajó (despacho 1841).

1.4. OUTROS.

Facilitarase documentación e material adicional (problemas resoltos detalladamente, vídeos explicativos, píldoras, cuestionarios de autoavaliación, etc.) que axuden a conseguir os resultados de aprendizaxe asociados ás competencias obxectivo.

2. MODALIDADE NON PRESENCIAL

2.1. ADAPTACIÓN DAS METODOLOXÍAS

2.1.1. SESIÓN MAXISTRAL

As clases impartiránse en modo online e en horario habitual (mañáns). Para este fin, se emplegarán as presentacións en PowerPoint e unha tableta dixitalizadora como elemento de apoio para calquera aclaración.

2.1.2. SEMINARIOS

Os seminarios impartiránse en horario habitual e empregando unha tableta dixitalizadora e demás recursos do campus remoto. As entregas (problemas e cuestionarios) cuxa calificación forma parte da avaliación continua se farán a través do campus remoto.

2.1.3. PRÁCTICAS DE LABORATORIO

As prácticas se impartirán en modo non presencial usando o campus remoto e materiais audiovisuais elaborados polos profesores. O traballo completarase co tratamiento de datos e a realización dunha proba consistente nun cuestionario de preguntas de resposta curta ou tipo test, que se faría de forma remota.

2.2. AVALIACIÓN

2.2.1. FIN DE CARREIRA: A avaliación en modalidade non presencial será igual á da modalidade presencial.

2.2.2. FIN DE CUATRIMESTRE: A avaliación de fin de cuatrimestre en modalidade non presencial se fará de acordo cos seguintes criterios: exame teoría tipo test, 35%; exame problemas, 45%; problemas resoltos en domicilio e de forma autónoma, 5%; cuestionarios en domicilio, 5%; prácticas, 10%. Aqueles alumnos que demostren ter responsabilidades laborais ou unha situación especial poderán ser avaliados soamente cun exame de toda a materia cun valor do 100% (teoría, 40%; problemas, 60%).

2.2.3. SEGUNDA OPORTUNIDADE. A avaliación de segunda oportunidade en modalidade non presencial será igual á da modalidade presencial. Aqueles alumnos que demostren ter responsabilidades laborais ou outra situación especial poderán ser avaliados soamente cun exame de toda a materia cun valor do 100% (teoría, 40%; problemas, 60%).

2.3. TITORÍAS

As titorías relativas á docencia das clases tipo A (teoría) e B (seminario) realizaránse nos despachos virtuais do Profesor José Luis Alonso (despacho 53) e da Profesora Sandra Rivas (despacho 2160) a través do campus remoto en horario de titorías e pedindo cita previa a través do correo electrónico. As titorías relativa ás prácticas (horas tipo C) seguirán o mesmo procedemento empregando o despacho virtual do Prof. Juan Carlos Parajó (despacho 1841).

2.4. OUTROS

Facilitarase documentación e material adicional (problemas resoltos detalladamente, vídeos explicativos, píldoras, cuestionarios de autoavaliación, etc.) que axuden a conseguir os resultados de aprendizaxe.

IDENTIFYING DATA

Empresa: Administración da tecnoloxía e a empresa

Subject	Empresa: Administración da tecnoloxía e a empresa			
Code	O07G410V01204			
Study programme	Grao en Enxeñaría Aeroespacial			
Descriptors	ECTS Credits 6	Choose Basic education	Year 1	Quadmester 2c
Teaching language	Castelán			
Department	Organización de empresas e márketing			
Coordinator	Sánchez Sellero, Francisco Javier			
Lecturers	Sánchez Sellero, Francisco Javier			
E-mail	javiss@uvigo.es			
Web	http://aero.uvigo.es			
General description	Conceptos básicos de Teoría Económica, Administración e Xestión de Empresas e Tecnoloxía; aplicación ao Sector Aeroespacial			

Competencias

Code

- A1 Que os estudantes demostrasen posuír e comprender coñecementos nunha área de estudo que parte da base da educación secundaria xeral, e adóitase atopar a un nivel que, aínda que se apoia en libros de texto avanzados, inclúe tamén algúns aspectos que implican coñecementos procedentes da vanguarda do seu campo de estudo
- B2 Planificación, redacción, dirección e xestión de proxectos, cálculo e fabricación no ámbito da enxeñaría aeronáutica que teñan por obxecto, de acordo cos coñecementos adquiridos segundo o establecido no apartado 5 da orde CIN/308/2009, os vehículos aeroespaciais, os sistemas de propulsión aeroespacial, os materiais aeroespaciais, as infraestruturas aeroportuarias, as infraestruturas de aeronavegación e calquera sistema de xestión do espazo, do tráfico e do transporte aéreo.
- B5 Capacidad para levar a cabo actividades de proxección, de dirección técnica, de peritación, de redacción de informes, de ditames, e de asesoramento técnico en tarefas relativas á Enxeñaría Técnica Aeronáutica, de exercicio das funcións e de cargos técnicos genuinamente aeroespaciais.
- B8 Coñecemento, comprensión e capacidade para aplicar a lexislación necesaria no exercicio da profesión de Enxeñeiro Técnico Aeronáutico.
- C6 Coñecemento adecuado do concepto de empresa, marco institucional e xurídico da empresa. Organización e xestión de empresas.
- D1 Capacidad de análise, organización e planificación
- D3 Capacidad de comunicación oral e escrita na lingua nativa
- D4 Capacidad de aprendizaxe autónoma e xestión da información
- D5 Capacidad de resolución de problemas e toma de decisións
- D6 Capacidad de comunicación interpersoal
- D8 Capacidad de razonamento crítico e autocrítico
- D9 Capacidad de traballo en equipo de carácter interdisciplinar
- D10 Capacidad de tratar e actuar en situacións de conflitos e negociación
- D12 Compromiso ético e democrático

Resultados de aprendizaxe

Expected results from this subject

Training and Learning Results

- Coñecemento, comprensión, análise e síntese da microeconomía e macroeconomía	A1	B5	D1
			D3
			D4
			D6
			D8
			D9
			D10
			D12

- Coñecemento dos aspectos básicos dos tipos de empresas e a súa xestión e organización	A1 B8	B2	C6	D1 D3 D4 D5 D6 D8 D9 D10 D12
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Contidos

Topic

A Empresa no Sistema Económico

Dirección Comercial

Dirección Financeira

Natureza e Estrutura Organizativa das Empresas:

cambio e innovación

Organizacións e Recursos Humanos: motivación e liderado

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección magistral	30	30	60
Actividades introductorias	1	1	2
Estudo de casos	18	35	53
Resolución de problemas e/ou exercicios	1.5	16.5	18
Resolución de problemas e/ou exercicios	3	14	17

*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 magistral	Exposición por parte do profesor dos contidos sobre a materia obxecto de estudio, bases teóricas . As sesións teóricas, poden completarse con dinámicas como análises de textos que axuden á comprensión dos conceptos teóricos da materia.
Actividades introductorias	Presentación da Materia, antes do inicio do curso normal
Estudo de casos	Análise dun feito, problema ou suceso real coa finalidade de coñecelo, interpretalo, resolvelo, xerar hipótese, contrastar datos, reflexionar, completar coñecementos, diagnosticalo e adestrarse en procedementos alternativos de solución.

Atención personalizada

Methodologies Description

Estudo de casos Realización individual ou en grupo de informes, resposta a problemas de empresas aeroespaciais e formulación de soluciones alternativas con seguimiento e indicaciones do docente, a partir de contidos da materia e a súa adaptación a problemáticas empresariais e sectoriais

Avaliación

	Description	Qualification	Training and Learning Results				
Resolución de problemas e/ou exercicios	Exames parciais e/ou final sobre contido teórico-práctico da materia	60	A1	B2	C6	D1 D3 D4 D5	B8
Resolución de problemas e/ou exercicios	Entrega de exercicios, informes, resolución de problemas e toma de decisiones, individual e en grupo (de forma autónoma)	40	A1	B2	C6	D1 D3 D4 D5 D6 D8 D9 D10 D12	B5 B8

Other comments on the Evaluation

A planificación da materia supón a aplicación dun sistema de avaliación continua (asistencia mínima do 80%). Polo que a cualificación final obterase da avaliación dos traballos de aula e realización dun exame final. Para ter en conta ditas cualificacións é necesario obter unha nota mínima de 4 sobre 10 no exame final. As datas e horarios das probas de avaliación das diferentes convocatorias son as especificadas no calendario de probas de avaliación aprobado pola xunta de centro para o curso 2020-2021. En caso de conflito ou disparidade entre as datas dos exames, prevalecerán as sinaladas na páxina web da titulación. Segunda convocatoria: a nota correspondente aos traballos de aula (40% da nota final) conservarase durante un curso académico, convocatorias de xuño e xullo. O estudiantado non asistente pode participar nun exame final que cobre todo o contido da materia.

Bibliografía. Fontes de información

Basic Bibliography

Fernandez Sanchez, Esteban, **Administración de Empresas**, 2010,
Schilling, M.A., **Dirección Estratégica de la Innovación Tecnológica**, 2008,

Complementary Bibliography

Bueno Campos, E., **Curso Básico de economía de la empresa**, 2004,
Fernández Sánchez y otros, **Introducción a los negocios para ingenieros**, 2008,
Hidalgo Nuchera y otros, **La Gestión de la Innovación y la Tecnología en las Organizaciones**, 2008,
Fernández Sánchez, E., **Estrategia de Innovación**, 2005,

Recomendacións

Subjects that continue the syllabus

Dirección e xestión de proxectos/O07G410V01701

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, datas de probas parciais e exposición de traballos
- * Metodoloxías docentes que se modifican; porcentaxes de avaliación e teledocencia
- * Mecanismo non presencial de atención ao alumnado (titorías); a través de campus remoto
- * Modificacións (se proceder) dos contidos a impartir
- * Bibliografía adicional para facilitar a auto-aprendizaxe
- * Outras modificacións

==== ADAPTACIÓN DA AVALIACIÓN ===

- * En caso de teledocencia o 50% dependerá dos exames parciais e o 50% según o aproveitamento das prácticas, seminarios e o informe e exposición do traballo sobre unha empresa do sector.
- * Novas probas
- * Información adicional

IDENTIFYING DATA**Tecnoloxía aeroespacial**

Subject	Tecnoloxía aeroespacial			
Code	O07G410V01205			
Study programme	Grao en Enxeñaría Aeroespacial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	1	2c
Teaching language	Castelán Galego			
Department	Enxeñaría mecánica, máquinas e motores térmicos e fluídos			
Coordinator	Campos Garrido, Carlos			
Lecturers	Gómez San Juan, Alejandro Manuel			
E-mail	cacampost@uvigo.es			
Web	http://aero.uvigo.es			
General description	Esta materia proporciona unha introdución aos fundamentos da Enxeñaría Aeroespacial.			

Competencias

Code

- A1 Que os estudantes demostrasen posuír e comprender coñecementos nunha área de estudo que parte da base da educación secundaria xeral, e adóitase atopar a un nivel que, aínda que se apoia en libros de texto avanzados, inclúe tamén algúns aspectos que implican coñecementos procedentes da vanguarda do seu campo de estudo
- B1 Capacidade para o deseño, desenvolvemento e xestión no ámbito da enxeñaría aeronáutica que teñan por obxecto, de acordo cos coñecementos adquiridos segundo o establecido no apartado 5 da orde CIN/308/2009, os vehículos aeroespaciais, os sistemas de propulsión aeroespacial, os materiais aeroespaciais, as infraestruturas aeroportuarias, as infraestruturas de *aeronavegación e calquera sistema de xestión do espazo, do tráfico e do transporte aéreo.
- B2 Planificación, redacción, dirección e xestión de proxectos, cálculo e fabricación no ámbito da enxeñaría aeronáutica que teñan por obxecto, de acordo cos coñecementos adquiridos segundo o establecido no apartado 5 da orde CIN/308/2009, os vehículos aeroespaciais, os sistemas de propulsión aeroespacial, os materiais aeroespaciais, as infraestruturas aeroportuarias, as infraestruturas de aeronavegación e calquera sistema de xestión do espazo, do tráfico e do transporte aéreo.
- B3 Instalación, explotación e mantemento no ámbito da enxeñaría aeronáutica que teñan por obxecto, de acuerdo cos coñecementos adquiridos segundo o establecido no apartado 5 da orde CIN/308/2009, os vehículos aeroespaciais, os sistemas de propulsión aeroespacial, os materiais aeroespaciais, as infraestruturas aeroportuarias, as infraestruturas de *aeronavegación e calquera sistema de xestión do espazo, do tráfico e do transporte aéreo.
- B4 Verificación e Certificación no ámbito da enxeñaría aeronáutica que teñan por obxecto, de acuerdo cos coñecementos adquiridos segundo o establecido no apartado 5 da orde CIN/308/2009, os vehículos aeroespaciais, os sistemas de propulsión aeroespacial, os materiais aeroespaciais, as infraestruturas aeroportuarias, as infraestruturas de aeronavegación e calquera sistema de xestión do espazo, do tráfico e do transporte aéreo.
- B6 Capacidade para participar nos programas de probas en voo para a toma de datos das distancias de despegamento, velocidades de ascenso, velocidades de perdas, maniobrabilidad e capacidades de aterraxe.
- B7 Capacidade de analizar e valorar o impacto social e medioambiental das solucións técnicas.
- B8 Coñecemento, comprensión e capacidade para aplicar a lexislación necesaria no exercicio da profesión de Enxeñeiro Técnico Aeronáutico.
- C9 Comprender a globalidade do sistema de navegación aérea e a complexidade do tráfico aéreo.
- C10 Comprender como as forzas aerodinámicas determinan a dinámica do voo e o papel das distintas variables involucradas no fenómeno do voo.
- C13 Comprender a singularidade das infraestruturas, edificacións e funcionamento dos aeroportos.
- C17 Coñecemento adecuado e aplicado á enxeñaría de: Os elementos fundamentais dos diversos tipos de aeronaves; os elementos funcionais do sistema de navegación aérea e as instalacións eléctricas e electrónicas asociadas; os fundamentos do deseño e construcción de aeroportos e os seus diversos elementos.
- C18 Coñecemento adecuado e aplicado á Enxeñaría de: Os fundamentos da mecánica de fluídos; os principios básicos do control e a automatización do voo; as principais características e propiedades físicas e mecánicas dos materiais.
- C19 Coñecemento aplicado de: a ciencia e tecnoloxía dos materiais; mecánica e termodinámica; mecánica de fluídos; aerodinámica e mecánica do voo; sistemas de navegación e circulación aérea; tecnoloxía aeroespacial; teoría de estruturas; transporte aéreo; economía e producción; proxectos; impacto ambiental.
- D1 Capacidade de análise, organización e planificación
- D2 Liderado, iniciativa e espírito emprendedor
- D3 Capacidade de comunicación oral e escrita na lingua nativa
- D4 Capacidade de aprendizaxe autónoma e xestión da información
- D6 Capacidade de comunicación inter persoal
- D8 Capacidade de razoamento crítico e autocrítico
- D9 Capacidade de traballo en equipo de carácter interdisciplinar
- D12 Compromiso ético e democrático

Resultados de aprendizaxe

Expected results from this subject

Training and Learning Results

Coñecemento xeral da tecnoloxía aeroespacial	A1	B1	C9	D1
		B2	C10	D2
		B3	C13	D3
		B4	C17	D4
		B6	C18	D6
		B8	C19	D8
			D9	
			D12	
			D13	
Coñecemento, comprensión e aplicación dos fundamentos do voo atmosférico das aeronaves, incluíndo os lanzadores e misiles	A1	B1	C9	D1
		B2	C10	D3
		B3	C17	D4
		B4	C18	D6
		B6	C19	D8
			D9	
			D13	
Coñecemento, comprensión e aplicación dos fundamentos do voo orbital dos vehículos espaciais	A1	B1	C10	D1
		B2	C18	D3
		B3		D4
		B4		D6
		B7		D8
		B8		D13
Coñecemento, comprensión e aplicación das distintas infraestruturas aeroportuarias e a navegación aérea	A1	B1	C9	D1
		B2	C13	D3
		B3	C17	D4
		B4	C19	D6
		B6		D8
		B7		D9
		B8		D13

Contidos

Topic

Industria Aeroespacial	- Introducción a industria aeroespacial - Organizacións aeronáuticas e espaciais
Infraestruturas Aeroportuarias	- Sistema Aeroportuario - Lonxitude de pista de voo - Configuración dos aeroportos - Terminais Aeroportuarias
Navegación e circulación aérea	- Seguridade na navegación aérea - Navegación e circulación aérea - Marco legal - Convenio de Aviación Civil Internacional - Marco organizativo - Sistema CNS - ATM - Marco técnico - Sistemas non autónomos. Axudas á navegación - Rutas e cartas aéreas - Organización do espazo aéreo
Vehículos aeroespaciais	- Clasificación de vehículos aeroespaciais - Aerostatos e aerodinos - Vehículos espaciais - Aeronaves de á rotativa
Arquitectura do avión	- Partes do avión - Materiais - Procesos de fabricación
Aerodinámica de perfís	- Orixe das cargas aerodinâmicas - Perfís aerodinâmicos - Curvas características - Entrada en perda de perfís - Perfís en réxime compresible

Actuacións do avión	<ul style="list-style-type: none"> - Forzas externas sobre o avión - Voo horizontal, rectilíneo e uniforme - Ascenso, descenso e planeo - Viraxe no plano vertical - Viraxe no plano horizontal - Actuacións en pista - Alcance - Autonomía
Sistemas de propulsión	<ul style="list-style-type: none"> - Introdución á propulsión - Propulsión a hélice - Propulsión a chorro
Instrumentos das aeronaves	<ul style="list-style-type: none"> - Instrumentos de voo e navegación - Instrumentos da planta propulsora - Agrupamento dos instrumentos

Planificación

	Class hours	Hours outside the classroom	Total hours
Actividades introductorias	1	0	1
Lección maxistral	26	52	78
Design Thinking	6	24	30
Resolución de problemas	12	16	28
Presentación	5	5.5	10.5
Exame de preguntas obxectivas	1	0	1
Exame de preguntas de desenvolvemento	1.5	0	1.5

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

Metodoloxía docente

	Description
Actividades introductorias	Actividades encamiñadas a tomar contacto e reunir información sobre o estudiantado, así como a presentar a materia.
Lección maxistral	O profesor exporá nas clases teóricas os contidos da materia. O estudiantado terá textos básicos de referencia para o seguimento da materia.
Design Thinking	O profesor presentará un tema sobre o que se levará a cabo un proxecto de industrialización do sector aeroespacial. O traballo desenvolverase en equipos / grupos de estudiantes. O obxectivo desta actividade é a resolución de problemas complexos baseados na lóxica, a imaxinación, a intuición e o razonamento sistémico de cada estudiante
Resolución de problemas	O profesor resolverá problemas e exercicios tipo de forma manual e o estudiantado terá que resolver exercicios similares para adquirir as capacidades necesarias.
Presentación	O profesor proporá un proxecto real e actual do sector aeroespacial e o estudiantado fará un exercicio de análisis, redactará unha proposta técnica fará a presentación de dita proposta nun tempo reglado na aula. Mediante debate o estudiantado será partície da avaliación de cada proposta. A presentación de dito proxecto será a finales do curso co fin de aplicar todos os coñecementos adquiridos na materia.

Atención personalizada

Methodologies	Description
Lección maxistral	O profesor atenderá persoalmente as dúbihdas e consultas do alumnado. Atenderanse dúbihdas en forma presencial, en especial nas clases de problemas e laboratorio e en titorías, como de forma non presencial, polos sistemas telemáticos dispoñibles para a materia.
Resolución de problemas	O profesor atenderá persoalmente as dúbihdas e consultas do alumnado. Atenderanse dúbihdas en forma presencial, en especial nas clases de problemas e laboratorio e en titorías, como de forma non presencial, polos sistemas telemáticos dispoñibles para a materia.

Avaliación

Description	Qualification	Training and Learning Results
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Resolución de problemas	Realizaranse probas escritas curtas para avaliar a adquisición de coñecemento de forma autónoma.	20	B1 B2 B3 B4 B7 B8 D9 D12	C13 C17 C19 D4 D6 D8	D1 D2 D3 D4 D8
Exame de preguntas obxectivas	Exame parcial que constará de preguntas tipo test e de resposta curta.	30	A1 B3 B4 B6	C9 C10 C13 C17 C18 C19	D4 D8
Exame de preguntas de desenvolvemento	Realizarase un exame final sobre os contidos da totalidade da materia.	50	A1 B1 B2 B3 B4 B6 B7 B8	C9 C10 C13 C17 C18 C19	D1 D3 D4 D8 D13

Other comments on the Evaluation

"As probas de avaliación continua (exames parciais) realizaranse dentro do horario lectivo"

Estudiantes non-asistentes ás clases presencias poden realizar un exame tanto en maio como en xuño/xullo que cubre 100% da nota final.

Bibliografía. Fontes de información

Basic Bibliography

Complementary Bibliography

FRANCHINI, S Y LÓPEZ GARCIA, O., **Introducción a la Ingeniería Aeroespacial**, Ed. Garceta, 2ª edición,
 ANDERSON, J.D., **Introduction to flight**, Ed. McGraw-Hill, 5th edition,
 ISIDORO CARMONA, **Aerodinámica y actuaciones de avión**, Ed. Paraninfo,
 TORENBECK, E Y WITTENBERG, H., **Flight Physics**, Springer,
 F.J. SÁEZ NIETO, L PÉREZ SANZ Y V.F. GÓMEZ COMENDADOR, **La navegación aérea y el aeropuerto**, Fundación AENA,
 M. GARCÍA CRUZADO, **Descubrir la operación de los aeropuertos**, Fundación AENA,
 ENAIRE, <https://www.enaire.es>,

Recomendacións

Subjects that it is recommended to have taken before

Física: Física I/O07G410V01103

Matemáticas: Álgebra lineal/O07G410V01102

Matemáticas: Cálculo I/O07G410V01101

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 determinénlo 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 ===

==== MEDIDAS EXCEPCIONAIS PLANIFICADAS ===

Ante a incerta e imprevisible evolución dá alerta sanitaria provocada pola COVID- 19, a Universidade establece unha planificación extraordinaria que se activará non momento en que as administracións e a propia institución ou 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, non momento que sexa preceptivo, ou desenvolvemento dá docencia dun xeito mais áxil e eficaz ao ser coñecido de antemán (ou cunha ampla antelación) polo alumnado e ou profesorado a través dá ferramenta normalizada e institucionalizada dás guías docentes DOCNET.

Metodoloxías docentes que se modifican

Lección maxistral: alternativamente, realizarase a través dá plataforma de Campus Remoto da Universidade de Vigo.

Clases Prácticas: En lugar de efectuar prácticas grupales, mantéñense as mesmas actividades pero de maneira individualizada cun contido simplificado pero mantendo os puntos da programación.

Seminarios: alternativamente, as tutorías realizaranse de forma remota segundo o apartado de Atención Personalizada en calquera horario acordado co alumnado.

Mecanismo non presencial de atención ao alumnado (tutorías)

As sesións de tutoría realizaranse alternativamente por medios telemáticos (email ó videoconferencia) baixo a modalidade de concertación previa.

Outras modificacións

==== ADAPTACIÓN DA AVALIACIÓN ===

- Parcial 1: 20% nota final
- Parcial 2: 20% nota final

Actividades que o alumnado pode completar no seu domicilio:

- Actividades de teoría: Resolución de cuestiós nas que o alumnado utilizará os medios virtuais como internet, bibliografía da materia, apuntamentos para a consulta de exemplos, documentación e comprensión de cuestones sobre a materia co fin de afianzar coñecementos. 5% dá nota final
- Resolución de problemas 5% dá nota final
- Exame final (50% dá nota final)

Tanto os examenes parciais e finais, constarán dun cuestionario tipo test de única resposta sobre os contidos de toda a materia + Resolución de problemas nos que se esixirá a entrega do problema resolto. Calquera medio dispoñible será tido en conta para a entrega das resolucións Fotos, escáner, documento a computador, etc. Utilizaranse as ferramentas que a Universidade de Vigo pon a disposición para devandito fin.

A convocatoria de segunda oportunidade constará dun exame final polo 100% da avaliación de forma remota. Será un exame combinado do tipo escrito e oral utilizando as ferramentas que a Universidade de Vigo pon a disposición para devandito fin.
