



(*)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

Escola de Enxeñaría Aeronáutica e do Espazo

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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 4th

Code	Name	Quadmester	Total Cr.
007G410V01701	Proyect direction and management	1st	6
007G410V01901	Navigational systems	2nd	6
007G410V01903	Materials for the aerospace industry	2nd	6
007G410V01904	Systems in real time	2nd	6
007G410V01905	Meteorology	2nd	6
007G410V01910	Information management systems	2nd	6
007G410V01913	Forming technology of aerospace materials	2nd	6
007G410V01924	Mechanics of flight	1st	6
007G410V01934	Fixed-wing and rotary wing aircrafts	1st	9

O07G410V01935	Maintenance and certification of aerospace vehicles	1st	9
O07G410V01944	Control and optimization	1st	6
O07G410V01945	Propulsion systems	1st	6
O07G410V01946	Aerospace Vehicles	1st	6
O07G410V01981	Professional internships	2nd	6
O07G410V01991	Final Year Dissertation	2nd	12

IDENTIFYING DATA				
Dirección e xestión de proxectos				
Subject	Dirección e xestión de proxectos			
Code	007G410V01701			
Study programme	Grao en Enxeñaría Aeroespacial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	4	1c
Teaching language	Castelán			
Department				
Coordinator	Rey González, Guillermo David			
Lecturers	Rey González, Guillermo David			
E-mail	guillermo.rey@uvigo.es			
Web	http://aero.uvigo.es			
General description	Esta materia aborda os aspectos técnicos, económico-financieros, legais e de xestión dos proxectos de enxeñaría aeroespacial.			

Resultados de Formación e Aprendizaxe	
Code	
A2	Que os estudantes saiban aplicar os seus coñecementos ao seu traballo ou vocación dunha forma profesional e posúan as competencias que adoitan demostrarse por medio da elaboración e defensa de argumentos e a resolución de problemas dentro da súa área de estudo
A3	Que os estudantes teñan a capacidade de reunir e interpretar datos relevantes (normalmente dentro da súa área de estudo) para emitir xuízos que inclúan unha reflexión sobre temas relevantes de índole social, científica ou ética
A4	Que os estudantes poidan transmitir información, ideas, problemas e solucións a un público tanto especializado como non especializado
A5	Que os estudantes desenvolvesen aquelas habilidades de aprendizaxe necesarias para emprender estudos posteriores cun alto grao de autonomía
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.
B4	Verificación e Certificación 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	Capacidade 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.
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.
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 produción; proxectos; impacto ambiental.
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
D5	Capacidade de resolución de problemas e toma de decisións
D6	Capacidade de comunicación interpersonal
D8	Capacidade de razoamento crítico e autocrítico
D9	Capacidade de traballo en equipo de carácter interdisciplinar
D10	Capacidade de tratar e actuar en situacións de conflitos e negociación
D11	Ter motivación pola calidade con sensibilidade cara a temas do ámbito dos estudos
D12	Compromiso ético e democrático
D13	Sustentabilidade e compromiso ambiental. Uso equitativo, responsable e eficiente dos recursos

Resultados previstos na materia

Expected results from this subject	Training and Learning Results			
Coñecemento, comprensión, análise e síntese da xestión económica dunha empresa e da xestión de proxectos	A2	B1	C19	D2
	A3	B2		D3
	A4	B4		D4
	A5	B5		D5
		B7		D6
		B8		D8
				D9
				D10
				D11
				D12
				D13
Coñecemento dos determinantes do impacto ambiental do sector aeronáutico	A2	B1	C19	D2
	A3	B2		D3
	A4	B7		D4
	A5	B8		D5
				D6
				D8
				D9
				D10
				D11
				D12
				D13

Contidos

Topic	
Tema 1. Xestión de Calidade. Xestión de Mercadotecnia.	Xestión de Calidade Xestión de Mercadotecnia.
Tema 2. Dirección empresarial: función directiva. Xestión de recursos humanos e do coñecemento.	
Tema 3. Xestión económico-financeira da empresa.	
Tema 4. Tipo de proxectos de enxeñaría. Planificación, avaliación e control dun proxecto.	
Tema 5. Xestión do alcance, tempo, calidade, recursos humanos e comunicacións dun proxecto. Custo e risco.	
Tema 6. Indicadores obxectivos do resultado dun proxecto.	
Tema 7. Impacto ambiental de aeroportos, aerolíneas e instalacións aeronáuticas. Normativa	

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	32	63	95
Aprendizaxe baseado en proxectos	10	16.5	26.5
Estudo de casos	8	18	26
Presentación	0.5	0	0.5
Exame de preguntas obxectivas	2	0	2

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

Metodoloxía docente

	Description
Lección maxistral	Exposición por parte do profesor/a dos contidos sobre a materia obxecto de estudo, bases teóricas e/ou directrices dun traballo, exercicio que o/a estudante ten que desenvolver.
Aprendizaxe baseado en proxectos	O/A estudante, de maneira individual ou en grupo, elabora un documento sobre a temática da materia ou prepara seminarios, investigacións, memorias, ensaios, resumos de lecturas, conferencias etc.
Estudo de casos	Actividades de aplicación dos coñecementos a situacións concretas e de adquisición de habilidades básicas e procedementais relacionadas coa materia obxecto de estudo. Desenvólvense en espazos especiais con equipamento especializado (Laboratorios, aulas informáticas, etc...)

Atención personalizada

Methodologies	Description
Lección maxistral	No ámbito da acción tutorial, distínguense accións de tutoría académica, así como de tutoría personalizada. No primeiro dos casos, o alumnado terá á súa disposición horas de tutorías nas que pode consultar calquera dúbida relacionada cos contidos, organización e planificación da materia, co desenvolvemento do proxecto, etc. As tutorías poden ser individualizadas, pero fomentaranse tutorías grupais para a resolución de problemas relacionados coas actividades a realizar en grupo, ou simplemente para informar ao docente da evolución do traballo colaborativo. Nas tutorías personalizadas, cada alumno, de maneira individual, poderá comentar co profesor calquera problema que lle estea impedindo realizar un seguimento adecuado da materia, co fin de atopar entre ambos algúns tipos de solución. Conxugando ambos os tipos de acción tutorial, preténdense compensar os diferentes ritmos de aprendizaxe mediante a atención á diversidade.
Aprendizaxe baseado en proxectos	No ámbito da acción tutorial, distínguense accións de tutoría académica, así como de tutoría personalizada. No primeiro dos casos, o alumnado terá á súa disposición horas de tutorías nas que pode consultar calquera dúbida relacionada cos contidos, organización e planificación da materia, co desenvolvemento do proxecto, etc. As tutorías poden ser individualizadas, pero fomentaranse tutorías grupais para a resolución de problemas relacionados coas actividades a realizar en grupo, ou simplemente para informar ao docente da evolución do traballo colaborativo. Nas tutorías personalizadas, cada alumno, de maneira individual, poderá comentar co profesor calquera problema que lle estea impedindo realizar un seguimento adecuado da materia, co fin de atopar entre ambos algúns tipos de solución. Conxugando ambos os tipos de acción tutorial, preténdense compensar os diferentes ritmos de aprendizaxe mediante a atención á diversidade.

Avaliación						
	Description	Qualification	Training and Learning Results			
Aprendizaxe baseado en proxectos	Realización dun proxecto relacionado co contido da materia	20	A2	B1	C19	D2
			A3	B2		D3
			A4	B4		D4
			A5	B5		D5
				B7		D6
Estudo de casos	Resolución de problemas e casos prácticos expostos nas sesións de prácticas	20		B8		D8
						D9
						D11
			A2	B1	C19	D3
			A3	B2		D4
Presentación	Presentación en clase do traballo en grupo desenvolvido.	20	A5	B4		D5
				B5		D8
				B7		D11
				B8		D13
			A2	B1	C19	D2
Exame de preguntas obxectivas	Exame tipo test	40	A3	B2		D3
			A4	B4		D4
			A5	B5		D5
				B7		D6
				B8		D8
						D9
						D10
						D11
						D12
						D13
			A2	B1	C19	D3
			A3	B2		D4
			A5	B4		D5
				B5		D11
				B7		D13
				B8		D8
						D9
						D10
						D11
						D12

Other comments on the Evaluation

O calendario de probas de avaliación atópase publicado na páxina Web do centro.

Primeira oportunidade.

(1) Estudantes que seguen o curso por Avaliación Continua.

Para poder superar a materia na primeira oportunidade, mediante Avaliación Continua, será necesario:

-Unha nota, no exame final de avaliación continua de, como mínimo, un 4.0.

-Asistir a, como mínimo, o 90% das sesións de prácticas.

-Entregar a totalidade de memorias prácticas e traballos da materia obtendo, como mínimo, unha nota de 3 en cada un deles.

No caso de non cumprir ditas condicións a nota final será a resultante do mínimo da nota media de AC e de 4.9.

(2) Estudante que desexen ser avaliados mediante avaliación global.

A avaliación do curso na primeira oportunidade realizarase, por defecto, mediante Avaliación Continua. O estudantado ten dereito a optar pola avaliación global segundo o procedemento e o prazo que estableza o centro para cada convocatoria.

A nota obtida neste exame representará o 100% da nota final. O estudante deberá obter unha nota mínima de 5.0 neste exame. Este exame pode ter unha parte para realizar nunha sala de computadores e / ou laboratorio, e comprenderá a totalidade da materia impartida, así como os contidos abordados en todas as sesións prácticas e traballos.

Segunda oportunidade e Fin de Carrera.

O estudantado que non superase a materia na primeira oportunidade poderá realizarán un exame que supoñerá o 100% da nota. O estudante deberá obter unha nota mínima de 5.0 neste exame. Este exame pode ter unha parte para realizar nunha sala de computadores e / ou laboratorio, e comprenderá a totalidade da materia impartida, así como os contidos abordados en todas as sesións prácticas e traballos.

En caso de detección de plaxio en calquera elemento de cualificación, a cualificación na devandita entrega será 0 e o feito será comunicado á dirección do Centro para os efectos oportunos.

Bibliografía. Fontes de información

Basic Bibliography

Project Management Institute, **Guía de los Fundamentos Para la Dirección de Proyectos (guía del PMBOK)**, 978-1628251944, 6, Project Management Institute, 2017

Cindy Lewis, Carl Chatfield, Timothy Johnson, **Microsoft Project 2019 Step by Step**, 978-1509307425, Microsoft Press, 2019

Philip Kotler, **Fundamentos De Marketing**, 978-6073238458, 13, ADDISON-WESLEY, 2017

Montserrat Cabrerizo, **Gestión Económica y Financiera de la Empresa**, 978-8426724540, 2, Marcombo Formación, 2017

Philip Kotler, **Marketing 5.0**, 978-8418709876, ALMUZARA, 2021

Daniel Arias Aranda, Beatriz Mingueta Rata, **Dirección de la producción y operaciones: Decisiones estratégicas**, 978-8436839005, Ediciones Pirámide, 2018

Complementary Bibliography

Recomendacións

Subjects that it is recommended to have taken before

Empresa: Administración da tecnoloxía e a empresa/O07G410V01204

IDENTIFYING DATA				
Navigational systems				
Subject	Navigational systems			
Code	007G410V01901			
Study programme	Grado en Ingeniería Aeroespacial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	González Jorge, Higinio			
Lecturers	González Jorge, Higinio			
E-mail	higiniog@uvigo.gal			
Web	http://aero.uvigo.es			
General description	This course expose the main procedures and systems used in aircraft navigation. 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.			

Training and Learning Results

Code	
A2	That the students know how to apply their knowledge to their work or vocation in a professional way and that they possess the competences that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study
A3	That the students have the capability to gather and interpret relevant data (usually within their area of study) to issue judgments that include a reflection on relevant social, scientific or ethical issues
A5	That the students develop those learning capabilities necessary to undertake further studies with a high degree of autonomy.
B1	Capability for design, development and management in the field of aeronautical engineering (in according with what is established in section 5 of order CIN / 308/2009), aerospace vehicles, aerospace propulsion systems, aerospace materials , airport infrastructures, air navigation infrastructures and space management, air traffic and transport management systems.
B6	Capability to participate in flight testing programs for take-off and landing distances, ascent speeds, loss speeds, maneuverability and landing capacities.
C19	Applied knowledge of: science and technology of materials; mechanics and thermodynamics; fluid mechanics; aerodynamics and flight mechanics; navigation and air traffic systems; aerospace technology; theory of structures; airborne transportation; economy and production; projects; environmental impact.
D3	Capability of oral and written communication in native language
D4	Capability of autonomous learning and information management
D6	Capabiliity for interpersonal communication
D8	Capabiliity for critical and self-critical reasoning
D11	Show motivation for quality with sensitivity towards subjects within the scope of the studies

Expected results from this subject

Expected results from this subject	Training and Learning Results			
Understanding the need for aircraft navigation systems	A2 A3 A5	B1 B6	C19	D3 D4 D6 D8 D11
Understanding of the theoretical foundations and operation of aircaft navigation systems.	A2 A3 A5	B1 B6	C19	D3 D4 D6 D8 D11
Understanding of external agents that affect these systems.				
Understanding of the methods to ensure the proper working of these systems.	A2 A3 A5	B1 B6	C19	D3 D4 D6 D8 D11

Contents

Topic

1. Introduction to aircraft navigation.	1.1. Basic concepts of cartography and geodesy. 1.2. Aeronautical charts. 1.3. Aircraft navigation concept. Observed, estimated, radioelectric and autonomous navigation. 1.4. Terminology (heading, azimuth, magnetic declination, nautical mile, knot, foot, etc.). 1.5. The wind in the air navigation. Wind triangle. 1.6. Orthodromic route. Characteristics, parameters and equations. 1.7. Loxodromic route. Characteristics, parameters and equations. 1.8. The altimetry in air navigation. Standard atmosphere. Pressure, density and temperature. The barometric altimeter.
2. Meteorology and aircraft navigation.	2.1. VMC and IMC weather conditions. Visual and instrumental navigation. VFR and IFR flight rules. 2.2. Basic flight instruments. 2.3. Technical requirements for visual and instrumental flight. 2.4. Organization of the aeronautical meteorological service in Spain through AEMET.
3. Conventional navigation systems.	3.1. Directional radio signals. 3.2. Route beacons. 3.3. Automatic direction finder (ADF). 3.4. Non-directional beacon (NDB). 3.5. High frequency omnidirectional radio beacon (VOR). 3.6. Long Range Navigation systems (LORAN and NavSat).
4. RNAV navigation.	4.1. Three-dimensional navigation system. Course line computer. 4.2. Inertial navigation system (INS). 4.3. Doppler radar.
5. Distance measuring equipment (DME).	5.1. Frequencies 5.2. DME theory. 5.3. Specifications and errors.
6. Instrument landing system (ILS).	6.1. Guide and locator information. Ground and on board systems. 6.2. Glide path. Ground and on board systems. 6.3. Distance information. Radio beacon. Ground and on board systems. 6.4. Compass radio beacons. 6.5. Visual information. VASIS system. 6.6 Category of the ILS.
7. Microwave landing system (MLS).	7.1. MLS principles. 7.2. Ground system. 7.3. On board system.
8. RADAR.	8.1. Introduction. 8.2. Primary RADAR. 8.3. Secondary RADAR. 8.4. Meteorological RADAR.
9. Global Navigation Satellite System (GNSS).	9.1. Principles of satellite navigation. 9.2. GNSS segments. 9.3. GNSS signals. 9.4. Operation of the GNSS system. 9.5. GPS, GLONASS, GALILEO and BEIDOU systems. 9.6. The future of the GNSS system.
10. Air traffic control systems (ATC).	10.1. Review of ATC systems. 10.2. Transponders 10.3. On board systems. 10.4. System operation 10.5. ADSB system. 10.6. Communications, navigation and surveillance in ATC.
11. Traffic alert and collision avoidance system (TCAS).	11.1. TCAS system. 11.2. TCAS operation.
12. Aircraft navigation and unmanned aerial vehicles.	12.1. Airspace. 12.2. Rules for unmanned aerial vehicles. 12.3. On board navigation systems in unmanned aerial vehicles. 12.4. Future trends in unmanned aerial vehicles.
13. Aircraft navigation and safety.	13.1. Governmental aeronautical safety agency (AESA). 13.2. Aircraft navigation services in Spain (ENAIRE). Air traffic management. Aeronautical information service (AIS).

Planning

	Class hours	Hours outside the classroom	Total hours

Lecturing	24	0	24
Practices through ICT	24	23	47
Mentored work	2	44.5	46.5
Objective questions exam	1.25	0	1.25
Objective questions exam	1.25	0	1.25
Report of practices, practicum and external practices	0	10	10
Project	0	20	20

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

Methodologies	
	Description
Lecturing	Exhibition of the contents of the subject through audiovisual media.
Practices through ICT	Problem solving through software tools such as Matlab, QGIS and Mission Planner.
Mentored work	The student will perform a project that consist of designing, implementing and verifying a navigation system for an unmanned aircraft, based on the GNSS and the INS system.

Personalized assistance	
Methodologies	Description
Lecturing	Classroom attention. Tutorials with previous appointment. Attention by email.
Practices through ICT	Classroom attention. Tutorials with previous appointment. Attention by email.
Mentored work	Tutorials with previous appointment. Attention by email.

Assessment						
	Description	Qualification	Training and Learning Results			
Objective questions exam	Partial exam I type test.	25	A2 A3 A5	B1 B6	C19	D3 D4 D6 D8 D11
Objective questions exam	Partial exam II type test.	25	A2 A3 A5	B1 B6	C19	D3 D4 D6 D8 D11
Report of practices, practicum and external practices	Each practicum will define a deliverable that the student must send to the professor before the indicated deadline.	30	A2 A3 A5	B1 B6	C19	D3 D4 D6 D8 D11
Project	The student must submit a final report with the work done. In addition, he/she must make an exposition of the work.	20	A2 A3 A5	B1 B6	C19	D3 D4 D6 D8 D11

Other comments on the Evaluation

The student has the right to opt for the global assessment according to the procedure and the deadline established by the centre for each call.

The continuous assessment will be carried out during university class hours.

The official exam dates are used for the student to take an exam-only assessment of the course if he/she does not follow the continuous assessment or fails it. This exam will consist of a test of 100 questions, its qualification will correspond to 100% of the course and will have a duration of 2 hours.

No marks for each of the parts will be kept between different exam sessions.

The calendar of evaluation tests officially approved by the Faculty is published on the web page:

<http://aero.uvigo.es/es/docencia/examenes/>

Sources of information

Basic Bibliography

Mike Tooley and David Wyatt, **Aircraft communications and navigation systems**, Elsevier, 2007

Eduardo Huerta, Aldo Mangiaterra y Gustavo Noguera, **GPS. Posicionamiento satelital**, UNR Editora, 2005

Myron Kayton and Walter R. Fried, **Avionics navigation systems**, Wiley, 1997

Complementary Bibliography

Robert Arán Escuer y J. R. Aragoneses Manso, **Sistemas de navegación aérea**, Paraninfo, 1983

Recommendations

Subjects that it is recommended to have taken before

Systems engineering and aerospace communications/O07G410V01925

IDENTIFYING DATA				
Materials for the aerospace industry				
Subject	Materials for the aerospace industry			
Code	007G410V01903			
Study programme	Grado en Ingeniería Aeroespacial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Álvarez González, David			
Lecturers	Álvarez González, David			
E-mail	davidag@uvigo.es			
Web	http://dept05.webs.uvigo.es/			
General description	The aim of this subject is to offer to the students knowledges and tools for the selection of materials in the aerospace field. 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.			

Training and Learning Results	
Code	
A2	That the students know how to apply their knowledge to their work or vocation in a professional way and that they possess the competences that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study
A3	That the students have the capability to gather and interpret relevant data (usually within their area of study) to issue judgments that include a reflection on relevant social, scientific or ethical issues
A5	That the students develop those learning capabilities necessary to undertake further studies with a high degree of autonomy.
B1	Capability for design, development and management in the field of aeronautical engineering (in according with what is established in section 5 of order CIN / 308/2009), aerospace vehicles, aerospace propulsion systems, aerospace materials , airport infrastructures, air navigation infrastructures and space management, air traffic and transport management systems.
C20	Appropriate knowledge applied to engineering: mechanics of fracture of the continuous media and their dynamic behavior, fatigue of structural instability and aeroelasticity.
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	Capabiliity for interpersonal communication
D8	Capabiliity for critical and self-critical reasoning
D11	Show motivation for quality with sensitivity towards subjects within the scope of the studies
D13	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources

Expected results from this subject				
Expected results from this subject		Training and Learning Results		
New	A2	B1	C20	D3
	A3			D4
	A5			D5
				D6
				D8
				D11
				D13
New	A2	B1	C20	D3
	A3			D4
	A5			D5
				D6
				D8
				D11
				D13

New	A2	B1	C20	D3
	A3			D4
	A5			D5
				D6
				D8
				D11
				D13

Contents

Topic	
Subject 1. Selection of Materials	Criteria employed for the selection of materials in function of his application. Employment of Indexes of Material and Indexes of Performance. Ashby diagrams. Management of databases of material properties.
Subject 2. Aerospace Alloys.	Steels. Light alloys. Titanium and Superalloys
Subject 3. Composite materials.	Manufacture and optimisation of material properties. Termo-mechanical Treatments. Mechanical and thermal properties of alloys. Classification: polymeric , metallic or ceramic matrix. Mechanical and thermal properties of the materials. Estimation of properties of compound materials.
Subject 4. Behaviour and Failure of aerospace materials	Friction and wear. Enbrittlement. Fracture. Corrosion and degradation. Fatigue. Creep.
Subject 5. Mechanical and adhesive joints.	Analysis of failures. Diagnostic and inspection of failures. Mechanical joints. Welding. Adhesive joints.
Subject 6. Quality control and Testing.	Classification and properties. Quality control of raw materials. Techniques of thermal analysis. Mechanical testing. Non destructive testing (NDT).

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	24	52.5	76.5
Laboratory practical	4	7	11
Autonomous problem solving	4	7.5	11.5
Studies excursion	6	2	8
Practices through ICT	10	17	27
Mentored work	2	10	12
Objective questions exam	2	0	2
Presentation	0.5	1.5	2

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

Methodologies

	Description
Lecturing	Oral presentation of the contents of the course.
Laboratory practical	Activities for the practical application of the knowledges purchased.
Autonomous problem solving	Resolution of problems and exercises related with the matter.
Studies excursion	Visits in groups to companies of the aeronautical sector.
Practices through ICT	Practical exercises of selection of materials with software CES-EduPack.
Mentored work	Oral presentation of mentored related with the employment of materials in the aerospace industry.

Personalized assistance

Methodologies	Description
Laboratory practical	Time in which the professor helps to the student to resolve and make the activities proposed in the lab.
Autonomous problem solving	Orientation that the teacher loans to the students for the correct resolution of the problems .
Lecturing	Attention that the professor loans of individual way to the students to resolve the doubts and difficulties that they find on the understanding of the contents of the matter.

Practices through ICT	Time devoted to the resolution of doubts, and to the practical application of the available computer tools for the selection of materials.
Mentored work	It will facilitate to the student orientation and documentation for the preparation of the mentored works.

Assessment						
	Description	Qualification	Training and Learning Results			
Laboratory practical	Reports of the lab work that the student will have to deliver (individual or in groups).	15	A2 A3 A5	B1	C20	D4 D5 D6 D8 D11 D13
Practices through ICT	Reports of the lab work that the student will have to deliver (individual or in groups).	15				
Objective questions exam	Individual written proof in which the student/to will have to answer to relative questions to the matter presented in the classroom.	40	A2 A3 A5	B1	C20	D3 D4 D5 D8 D11 D13
Presentation	Oral presentation by groups of a subject proposed during the development of the matter.	30	A2 A3 A5	B1	C20	D3 D4 D5 D6 D8 D11

Other comments on the Evaluation

The data corresponding to schedules, classrooms and exam dates can be consulted in an updated way on the centre's website: <http://aero.uvigo.es/gl/docencia/exames>

To pass the course in the first call, it will be necessary to achieve at least 40% of the maximum mark in each of the evaluated tests. If said 40% is not reached in any test, the final grade will be limited by 4.9. The qualification of the practical part will be maintained for the second call.

The student has the right to opt for the global evaluation according to the procedure and the term established by the center for each call. In the case of opting for the global evaluation, the subject will be evaluated with an exam that will include contents developed in the theoretical classes and the contents and problems developed during the practices. The same methodology will be applied for the evaluation in the end of program call.

The use of any type of electronic device during the evaluation tests is prohibited, unless expressly authorized. The fact of introducing any unauthorized device in the classroom during the evaluation test will be considered a reason for not passing the subject. In this case, the student will obtain a grade of 0 (failed).

Evaluation for non-assistants: the qualification course will be that of a final exam to evaluate all the competences assigned to the subject.

Sources of information

Basic Bibliography

Donald R. Askeland, **Ciencia e ingeniería de los materiales**, 6ª, Cengage Learning, 2012

William F. Smith, **Fundamentos de la Ciencia e Ingeniería de los Materiales**, 4ª, McGraw-Hill, 2014

Complementary Bibliography

A. Brent, **Plastics. Materials and processing**, 3ª, Pearson Prentice Hall, 2006

J. Antonio Pero-Sanz, **Ciencia e ingeniería de materiales. Estructura, transformaciones, propiedades y selección**, 5ª, CIE-Dossat 200, 2000

Michael F. Ashby, **Materiales para ingeniería 1. Introducción a las propiedades, las aplicaciones y el diseño**, 1ª, Reverté, 2008

Michael F. Ashby, **Materiales para ingeniería 2. Introducción a la microestructura, el procesamiento y el diseño**, 1ª, Reverté, 2009

Prasad, N.E., **Aerospace materials and Materials technologies**, 1, Springer, 2017

Recommendations

Subjects that it is recommended to have taken before

Materials science and technology/O07G410V01304

Resistance of materials and resilience/O07G410V01405

Aerospace manufacturing/O07G410V01501

IDENTIFYING DATA				
Systems in real time				
Subject	Systems in real time			
Code	007G410V01904			
Study programme	Grado en Ingeniería Aeroespacial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Orgeira Crespo, Pedro			
Lecturers	Orgeira Crespo, Pedro			
E-mail	porgeira@uvigo.es			
Web	http://aero.uvigo.es			
General description	Real time systems in aerospace are introduced, explaining the requirements of real time systems for aerospace vehicles. 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.			

Training and Learning Results				
Code				
A2	That the students know how to apply their knowledge to their work or vocation in a professional way and that they possess the competences that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study			
A3	That the students have the capability to gather and interpret relevant data (usually within their area of study) to issue judgments that include a reflection on relevant social, scientific or ethical issues			
A5	That the students develop those learning capabilities necessary to undertake further studies with a high degree of autonomy.			
C24	Appropriate knowledge applied to engineering: systems of aircrafts and automatic systems of flight control of the aerospace vehicles.			
C31	Appropriate knowledge applied to engineering: physical phenomena of air defense systems, their qualities and their control, stability and automatic control systems.			
D11	Show motivation for quality with sensitivity towards subjects within the scope of the studies			

Expected results from this subject				
Expected results from this subject			Training and Learning Results	
Knowledge, understanding and application of the requests of the systems in real time to the basic systems of control of flight			C24	
Knowledge, understanding and application of the requests of the systems in real time to the basic systems of control of flight			A2 A3 A5	C24 C31 D11

Contents				
Topic				
Reactive and real-time systems				
Reliability and fault tolerance				
Concurrent programming, synchronization and communication				
Human-machine interface				
Real-time systems programming: real-time operating systems and synchronous/asynchronous programming				
Simulation and verification of real-time systems				

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	30	59	89
Laboratory practical	13	16	29
Mentored work	7	22.5	29.5

Objective 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. The students will have basic texts of reference for the follow-up of the subject.
Laboratory practical	Computer tools will be used to solve problems and exercises and apply the knowledge obtained in the theoretical classes, and the students will have to solve similar exercises to acquire the necessary capacities
Mentored work	Project developed by the student, and mentored by the teacher

Personalized assistance	
Methodologies	Description
Lecturing	The professor will personally answer the doubts and queries of the students. Questions will be addressed in person, especially in the classes of problems and laboratory and tutorials, as a non-contact, by the telematic systems available for the subject
Laboratory practical	The professor will personally answer the doubts and queries of the students. Questions will be addressed in person, especially in the classes of problems and laboratory and tutorials, as a non-contact, by the telematic systems available for the subject
Mentored work	The professor will personally answer the doubts and queries of the students. Questions will be addressed in person, especially in the classes of problems and laboratory and tutorials, as a non-contact, by the telematic systems available for the subject

Assessment					
	Description	Qualification	Training and Learning Results		
Laboratory practical	Reports on practical classes, as required	20	A2 A3 A5	C24 C31	D11
Mentored work	Presentation and report on the mentored work	40	A2 A3 A5	C24 C31	D11
Objective questions examExamen		40	A2 A3 A5	C24 C31	D11

Other comments on the Evaluation

The student has the right to opt for the global assessment according to the procedure and the deadline established by the centre for each call.

First call:

- For the evaluation of the exam to be carried out, the student must have attended all the practices and made all the required deliveries of laboratory practices and supervised work (in the case it exists), on the dates indicated; In addition, it will be necessary that the average grade of the deliveries exceeds 4 out of 10.

- The minimum mark to be reached in the final continuous assessment exam will be 4 out of 10 to be able to weigh the exam, supervised work (in case of taking the latter), and practicals. I

- To pass the subject, you must pass a weighted grade (exam, work, practice) of 5 out of 10. The exam may consist of test questions and / or short questions and / or questions developmental.

Second call:

- Students who have not passed the subject in the first call will take an exam-only assesment that will have the same format and the same requirements as the first opocallrtunity. In order to pass the subject, the weighted minimum mark between exam and practice reports will be 5 out of 10, and it is also necessary that this test exceed 4 out of 10.

As a student at the University of Vigo, the University Student Statute, approved by Royal Decree 1791/2010 of December 30, establishes in its article 12, point 2d, that the university student has the duty to []refrain from the use or cooperation in fraudulent procedures in assessment tests, in the work carried out or in official university documents []. Therefore, the student is expected to have adequate ethical behavior. If unethical behavior is detected during the course (copying,

plagiarism, use of unauthorized electronic devices or others), the student will be penalized with a grade of 0.0 on the written or deliverable test where such fraud is detected.

Sources of information

Basic Bibliography

Alan Burns, Andy Wellings, **Sistemas de tiempo real y lenguajes de programación**, 3ª, Prentice Hall, 1997

Xiacong Fan, **Real-Time Embedded Systems: design principles and engineering practices**, 1ª, Newnes, 2018

Jiacung Wang, **Real-Time embedded systems**, 1ª, Wiley & Sons, 2017

Complementary Bibliography

Recommendations

Subjects that it is recommended to have taken before

Air transport and airborne systems/O07G410V01404

IDENTIFYING DATA				
Meteorology				
Subject	Meteorology			
Code	007G410V01905			
Study programme	Grado en Ingeniería Aeroespacial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	de la Torre Ramos, Laura			
Lecturers	de la Torre Ramos, Laura Nieto Muñiz, Raquel Olalla			
E-mail	ltr@uvigo.es			
Web	http://aero.uvigo.es			
General description	Introduction to meteorology, the measurement of parameters, the instrumentation and its influence on the flight. 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.			

Training and Learning Results	
Code	
A2	That the students know how to apply their knowledge to their work or vocation in a professional way and that they possess the competences that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study
A3	That the students have the capability to gather and interpret relevant data (usually within their area of study) to issue judgments that include a reflection on relevant social, scientific or ethical issues
A5	That the students develop those learning capabilities necessary to undertake further studies with a high degree of autonomy.
C10	Understand how the aerodynamic forces determine the dynamics of the flight and the role of the different variables therein.
D11	Show motivation for quality with sensitivity towards subjects within the scope of the studies

Expected results from this subject			
Expected results from this subject	Training and Learning Results		
Knowledge of the meteorological effects and its causes	A2 A3 A5		D11
Understanding of the usage and impact of meteorology on aircraft operations.	A2 A3 A5	C10	D11
Understanding of the theoretical foundations of meteorological systems and instrumentation	A2 A3 A5		D11

Contents	
Topic	
Atmosphere and meteorology	The atmosphere Composition and structure Meteors
Instrumentation and meteorological information	Meteorological observations in airfields Meteorological observations from aircraft The meteorological radar Satellites Aeronautical meteorological Information
Thermodynamics	Sounding data Isobaric and adiabatic condensation Aerological diagrams Temperature and humidity parameters and stability levels Stability assessment Effects on the flight

Wind	Introduction Equation of movement Horizontal flow Isobaric coordinates Thermal wind Wind structure in the PBL Mountains and wind Effects on the flight
Clouds microphysics	Aerosols Previous concepts Warm clouds Cold clouds Effects on the flight
Convection	Previous concepts Convective storms Dynamics of supercells Electricity Downburst Mesoscale convective systems (MCS) Effects on the flight
Visibility	Introduction Factors affecting visibility Fogs and strata Duststorms Effects on the flight
Depressions	Introduction Tropical cyclones Extratropical cyclones Thermal lows Effects on the flight
Meteorological prediction	Prediction Numerical weather prediction
Meteorology and space operations	Fundamental characteristics Launching conditions Reentry conditions Influence in orbit

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	24	15	39
Autonomous problem solving	15	20	35
Practices through ICT	10	0	10
Presentation	1	5	6
Objective questions exam	2.5	30.5	33
Essay	0	27	27

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

Methodologies

	Description
Lecturing	Theoretical classes in the classroom for all the group. The students will have to complete assignments that will help to fix or expand their knowledge.
Autonomous problem solving	Student will be asked to perform tasks or exercises autonomously. Part of these exercises will have to be completed out of the classroom. The professor will supervise the tasks
Practices through ICT	Seminars using computers. Personalized follow-up of the student during the class. Students will be asked to solve different exercises.
Presentation	Presentation in class to demonstrate what was learned during the completion of the essay oriented to teaching classmates

Personalized assistance

Methodologies	Description
Lecturing	Assistance during class and tutorials
Practices through ICT	Assistance during class and tutorials

Autonomous problem solving	Assistance during class and tutorials
Presentation	Assistance during class and tutorials
Tests	Description
Essay	Assistance during class and tutorials

Assessment					
	Description	Qualification	Training and Learning Results		
Lecturing	Active participation in classes and in the proposed activities will be evaluated	10	A2 A3 A5	C10	D11
Autonomous problem solving	Evaluation of the student's performance in the proposed tasks or problem resolution.	25	A2 A3 A5	C10	D11
Practices through ICT	Evaluation of the student's involvement in classes	5	A2 A3 A5	C10	D11
Presentation	Students will have to make a presentation on a topic prepared outside of class hours, aimed at helping their classmates learn how meteorology can affect aeronautical or space operations.	10	A2		D11
Objective questions exam	Answering of short answers questions.	40	A2 A3 A5	C10	D11
Essay	Students will have to do an essay focused on how meteorology can affect aeronautic or space operations	10	A2 A3 A5		D11

Other comments on the Evaluation

The default assessment option will be continuous assessment. The student has the right to opt for the exam-only assessment according to the procedure and the deadline established by the centre for each call.

Continuous assessment:

To pass the subject through continuous assessment, it will be compulsory to attend at least 21 hours out of the 25 face-to-face sessions corresponding to the practices in computer rooms (seminars) and deliver all the tasks proposed to be done outside the classroom (both for the theoretical and the practical part).

It will also be mandatory: i) to take the written test, ii) to make the presentation

In addition, the student will have to achieve at least half of the total grade in each of the assignments that are graded.

Exam-only assessment:

The exam consists of a theoretical part and another of seminars, as well as a 10-minute presentation on a topic to be agreed with the professor.

Second call:

100% exam (minimum grade required to pass: 5 out of 10)

In case of not attending the test, or not passing it, the student will be evaluated in the same way as the rest of the students for the following calls.

End-of-program call

The student who chooses to take the exam at the end of the program will be evaluated only with the exam (which will be worth 100% of the grade). In case of not attending this exam, or not passing it, it will be evaluated in the same way as the rest of the students for the following calls.

Exam dates:

The exam dates are published on the website <http://aero.uvigo.es/gl/docencia/exames>

Sources of information

Basic Bibliography

J. V. Iribarne, W. L. Godson, **Termodinámica de la atmósfera**, Ministerio de Medioambiente, 1996

Wallace, J.M. Y Hobbs, P, **Atmospheric Science**, Elsevier, 2006

<http://www.aemet.es/es/portada>,

www.meted.ucar.edu/index.php,

González López, Blanca, **Meteorología aeronáutica**, 3, 2014

Complementary Bibliography

Bohren, C. y Albrecht, B., **Atmospheric Thermodynamics**, Oxford University Press, 1998

Houze, R.A, **Cloud Dynamics**, Academic Press, 1993

www.zamg.ac.at/docu/Manual/SatManu/main.htm,

Recommendations

IDENTIFYING DATA				
Information management systems				
Subject	Information management systems			
Code	007G410V01910			
Study programme	Grado en Ingeniería Aeroespacial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Otero Cerdeira, Lorena			
Lecturers	Otero Cerdeira, Lorena			
E-mail	locerdeira@uvigo.es			
Web	http://aero.uvigo.es			
General description	Introduction to companies information systems regarding their security and management tools. 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.			

Training and Learning Results	
Code	
A2	That the students know how to apply their knowledge to their work or vocation in a professional way and that they possess the competences that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study
A3	That the students have the capability to gather and interpret relevant data (usually within their area of study) to issue judgments that include a reflection on relevant social, scientific or ethical issues
A5	That the students develop those learning capabilities necessary to undertake further studies with a high degree of autonomy.
C24	Appropriate knowledge applied to engineering: systems of aircrafts and automatic systems of flight control of the aerospace vehicles.
D11	Show motivation for quality with sensitivity towards subjects within the scope of the studies

Expected results from this subject			
Expected results from this subject	Training and Learning Results		
RA1: Understanding, application and analysis of information management systems in aerospace projects.	A2 A3 A5	C24	D11

Contents	
Topic	
Information	- Encryption - Storage - Processing - Usage
Information systems	- Information resources - Tools - Transmission of information - Analysis
Security	- Threats and Countermeasures - Cybersecurity - Data protection
Management	- Norms and Certification - Standards - Interoperability - Interfaces between applications

Planning			
	Class hours	Hours outside the classroom	Total hours

Lecturing	18	36	54
Case studies	20	30	50
Problem solving	11	25	36
Introductory activities	1	1.5	2.5
Essay questions exam	2.5	5	7.5

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

Methodologies	
	Description
Lecturing	Exhibition by the teaching staff of the contents on the subject under study, theoretical bases and / or guidelines of a work, exercise or project to be developed by the student.
Case studies	Analysis of a fact, problem or real event in order to know it, interpret it, solve it, generate hypotheses, contrast data, reflect, complete knowledge, diagnose it and train in alternative solution procedures.
Problem solving	Solve problems and / or exercises related to the subject. The student must develop a correct or correct solution and interpret the results.
Introductory activities	Activities aimed at organizing the subject, gathering sources of information, as well as presenting the content and time planning.

Personalized assistance

Methodologies	Description
Problem solving	The tutorials will be carried out, preferably, by telematic means: email or through the personal office of the teaching staff on the remote campus of the university, within the teaching staff tutoring hours (published on the centre's website). It will be necessary to contact the teachers in advance by email to set the time for the tutoring.

Assessment		Qualification	Training and Learning Results		
	Description				
Case studies	Test in which the student must analyze a fact, problem or real event in order to know it, interpret it, solve it, generate hypotheses, contrast data, reflect, complete knowledge, diagnose it and train in alternative solution procedures. Learning outcomes assessed: RA1	10	A2 A3 A5	C24	D11
Problem solving	Periodic individual or group deliveries indicated by the teacher / who will serve as information on the progress of the student and will also be indicators of their attendance. Learning outcomes assessed: RA1	30	A2 A3 A5	C24	D11
Essay questions exam	Partial tests that include open questions about the content of the subject (none exceeds 40%). Students must develop, relate, organize and present the knowledge they have on the subject in a reasoned answer. Learning outcomes assessed: RA1	60	A2 A3 A5	C24	D11

Other comments on the Evaluation

General remarks:

The student will be able to choose the evaluation system that will be applied to the subject. For this, you must choose, in the first 15 days of the semester, between continuous assessment or exam-only assessment (a single exam at the end of the semester). If you do not specify the type of evaluation desired, it is understood that you opt for continuous evaluation.

The dates and times of the evaluation tests of the different calls are those specified in the evaluation tests calendar approved by the Faculty Board for the 2023-24 academic year.

Continuous assessment tests will be conducted within school hours.

General evaluation criteria:

To pass the subject, the student must obtain, as a final grade, a grade equal to or greater than 5. If in any of the blocks the student obtains a grade lower than 4, even if the average grade is equal to or greater than 5, the subject It will be suspended and the final grade that will appear in the minutes will be Suspense (4).

Evaluation criteria for attendees 1st call:

All students who choose the continuous assessment modality will be evaluated continuously by taking tests and activities, developed throughout the semester, applying the general evaluation criteria described in the previous section.

Evaluation criteria for non-attendees 1st call:

All students who opt for the non-attendance mode will be evaluated with a single final exam (100% of the grade) that will encompass everything seen throughout the semester, applying the general evaluation criteria described above. The student has the right to opt for the global assessment according to the procedure and the deadline established by the centre for each call.

Evaluation criteria for 2nd call and end of degree:

In the second opportunity (July) and in the end-of-degree call, students will be evaluated with a single final exam (100% of the grade) that will encompass all the seen throughout the semester, applying the general evaluation criteria described above. maintaining, if applicable, the qualifications obtained for problem solving, case studies, and / or exercises and attendance and participation.

Evaluated competences: the same as in the evaluation system for assistants. Evaluated learning outcomes: the same as in the evaluation system for assistants.

Sources of information

Basic Bibliography

Connolly, T.M.; Begg, C., **Sistemas de bases de datos: un enfoque práctico para diseño, implementación y gestión**, 4, Pearson Educación, 2005

Elena Ruiz Larrocha, **Nuevas tendencias en los sistemas de información**, Editorial Universitaria Ramón Areces, 2017

Complementary Bibliography

Recommendations

Subjects that it is recommended to have taken before

Computer science/O07G410V01104

IDENTIFYING DATA				
Tecnoloxías para conformado de materiais aeroespaciais				
Subject	Tecnoloxías para conformado de materiais aeroespaciais			
Code	O07G410V01913			
Study programme	Grao en Enxeñaría Aeroespacial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4	2c
Teaching language	Castelán			
Department				
Coordinator	Carou Porto, Diego			
Lecturers	Carou Porto, Diego			
E-mail	diecapor@uvigo.es			
Web	http://aero.uvigo.es			
General description	Esta materia presenta unha introdución á enxeñaría e a industrialización do produto cun enfoque práctico e moderno á fabricación de compoñentes aeroespaciais e a enxeñaría de procesos.			

Resultados de Formación e Aprendizaxe

Code				
A2	Que os estudantes saiban aplicar os seus coñecementos ao seu traballo ou vocación dunha forma profesional e posúan as competencias que adoitan demostrarse por medio da elaboración e defensa de argumentos e a resolución de problemas dentro da súa área de estudo			
A3	Que os estudantes teñan a capacidade de reunir e interpretar datos relevantes (normalmente dentro da súa área de estudo) para emitir xuízos que inclúan unha reflexión sobre temas relevantes de índole social, científica ou ética			
A5	Que os estudantes desenvolvesen aquelas habilidades de aprendizaxe necesarias para emprender estudos posteriores cun alto grao de autonomía			
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 produción; proxectos; impacto ambiental.			
D11	Ter motivación pola calidade con sensibilidade cara a temas do ámbito dos estudos			

Resultados previstos na materia

Expected results from this subject	Training and Learning Results		
O/A estudante coñece os procesos de produción, os seus principais parámetros definitorios e o seu campo de aplicación.	A2 A3 A5	C19	D11
O/A estudante coñece toda a información necesaria para levar a cabo un proceso de produción.	A2 A3 A5	C19	D11
O/A estudante coñece toda a información necesaria para levar a cabo un proceso de produción.	A2 A3 A5	C19	D11
Coñecer adecuadamente e de forma aplicada á enxeñaría as prestacións tecnolóxicas, as técnicas de optimización dos procesos de fabricación con materiais utilizados no sector aeroespacial para modificar as súas propiedades funcionais mecánicas.	A2 A3 A5	C19	D11

Contidos

Topic			
Bloque I	1. Deseño de produto 2. Elaboración de prototipos. Fabricación aditiva 3. Conformado de polímeros e materiais compostos. Simulación 4. Conformado por eliminación de material 5. Conformado mediante métodos non convencionais 6. Aplicación de ferramentas CAM na simulación do proceso de mecanizado 7. Automatización. Industria 4.0 no sector aeroespacial 8. Monitorización de procesos 9. Calidade e innovación industrial		
Bloque II	Proxectos		

Planificación			
	Class hours	Hours outside the classroom	Total hours
Lección maxistral	16	25	41
Prácticas con apoio das TIC	7.5	15	22.5
Aprendizaxe colaborativa	18	12	30
Aprendizaxe baseado en proxectos	1.5	37.5	39
Prácticas de laboratorio	5	8	13
Saídas de estudo	2	0	2
Exame de preguntas obxectivas	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.			

Metodoloxía docente	
	Description
Lección maxistral	Exposición por parte do profesor dos contidos fundamentais da materia.
Prácticas con apoio das TIC	Introdución ao emprego de software de simulación de procesos de fabricación por parte do profesor. Coas instrucións recibidas e traballo autónomo, as/os estudantes poderán resolver problemas específicos que permitan mellorar o seu coñecemento sobre os procesos estudados.
Aprendizaxe colaborativa	O profesor proporá traballos a realizar en grupo para aplicar os coñecementos adquiridos.
Aprendizaxe baseado en proxectos	O obxectivo prioritario deste curso será a aprendizaxe adquirida mediante o deseño e desenvolvemento de produto/proceso, que se realizará en función dos medios dispoñibles, aplicando contidos, técnicas e resolución de problemas, adquiridos en teoría e práctica
Prácticas de laboratorio	Fabricación de pezas mediante os medios de fabricación do laboratorio.
Saídas de estudo	Saídas a empresas, centros tecnolóxicos e outras institucións.

Atención personalizada	
Methodologies	Description
Lección maxistral	Prestarase atención ao estudantado tanto no horario lectivo como no de titorías.
Aprendizaxe baseado en proxectos	Prestarase atención ao estudantado tanto no horario lectivo como no de titorías.
Prácticas con apoio das TIC	Prestarase atención ao estudantado tanto no horario lectivo como no de titorías.
Aprendizaxe colaborativa	Prestarase atención ao estudantado tanto no horario lectivo como no de titorías.
Prácticas de laboratorio	Prestarase atención ao estudantado tanto no horario lectivo como no de titorías.
Saídas de estudo	Prestarase atención ao estudantado tanto no horario lectivo como no de titorías.

Avaliación				
	Description	Qualification	Training and Learning Results	
Lección maxistral	Evaluación de conceptos mediante cuestionario breve	20	A2 A3 A5	C19
Prácticas con apoio das TIC	Entrega de memorias de prácticas	20	A2 A3 A5	C19 D11
Aprendizaxe colaborativa	Realización dos traballos propostos e entrega de informes, pezas.	20	A2 A3 A5	C19
Aprendizaxe baseado en proxectos	Entrega memoria de proxecto	40	A2 A3 A5	C19 D11

Other comments on the Evaluation

O modelo de avaliación é avaliación continua. O/A estudante ten dereito a optar pola avaliación global según o procedemento e o prazo que estableza o centro para cada convocatoria. O exame global consistirá nun exame escrito en data oficial que cubra todos os aspectos avaliados en *evaluación continua.

PRIMEIRA OPORTUNIDADE:

A materia se avalía en base a:

-Memoria do proxecto (nota máxima 4 puntos).

- Prácticas TIC (nota máxima 2 puntos). Entrega obrigatoria de memorias de prácticas nas datas estipuladas.
- Aprendizaxe colaborativo (nota máxima 2 puntos). Se deberá participar nas actividades propostas durante o curso e presentar as pezas e informes solicitados. Este apartado será avaliado en grupo.
- Cuestionario breve (nota máxima 2 puntos)

Aprobarán a materia aqueles estudantes que consigan unha nota igual ou superior a 5 puntos.

SEGUNDA OPORTUNIDADE:

O método de avaliación é o mesmo que o descrito para a PRIMEIRA OPORTUNIDADE.

Se poderán gardar traballos da primeira oportunidade con calificación >5. A nota do exame non se gardará.

OUTRAS CONSIDERACIÓNS:

As/os estudantes non-asistentes serán avaliados cun exame final que cobre 100% das competencias da materia.

As actividades de laboratorio non se podrerán recuperar unha vez finalizadas as datas fixadas.

O calendario de probas de avaliación aprobado oficialmente pola Xunta de Centro da EEAE atópase publicado na páxina web <http://aero.uvigo.es/gl/docencia/exames>

A avaliación fin de carreira seguirá os mesmos criterios ca avaliación de 2ª oportunidade.

Bibliografía. Fontes de información

Basic Bibliography

Mikell P. Groover, **Fundamentos de manufactura moderna : materiales, procesos y sistemas**, 3, Prentice-Hall, 2007

S. Kalpakjian, S.R. Schmid, **Manufactura, Ingenieria y Tecnología**, 7, Pearson Education, 2014

Mikell P. Groover, **Automation, production systems, and computer-integrated manufacturing**, 978-1-292-07611-9, 4, Pearson, 2016

Complementary Bibliography

T. Black, R. Kohser, **Degarmo's Materials and Processes in Manufacturing**, 12, Wiley, 2017

John G. Nee, **Fundamentals of Tool Design**, 6, SME, 2010

Sham Tickoo, **Catia v5-6 R2014 for designers**, 12, Shererville IN: CAD/CIM Technologies, 2015

Egberto Garijo Gómez, **Diseño y fabricación con CATIA v5 : módulos CAM : mecanización por arranque de viruta**, 1, Visión Libros,, 2012

D. Carou, J.P. Davim, **Machining of Light Alloys Aluminum, Titanium, and Magnesium**, 1, CRC Press, 2019

D. Carou, **Aerospace and digitalization**, 1, Springer, 2021

Piers Bizony, **The art of NASA : the illustrations that sold the missions**, 1, Motorbooks, 2020

Recomendacións

Subjects that it is recommended to have taken before

Fabricación aeroespacial/O07G410V01501

IDENTIFYING DATA				
Mechanics of flight				
Subject	Mechanics of flight			
Code	O07G410V01924			
Study programme	Grado en Ingeniería Aeroespacial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	#EnglishFriendly Spanish English			
Department				
Coordinator	Orgeira Crespo, Pedro			
Lecturers	Gómez San Juan, Alejandro Manuel Orgeira Crespo, Pedro			
E-mail	porgeira@uvigo.es			
Web	http://aero.uvigo.es			
General description	Flight mechanics include the study of the performance, stability, and static and dynamic control of aerospace vehicles (focusing on fixed-wing aircraft in this course), as well as flight qualities and tests. 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.			

Training and Learning Results				
Code				
A2	That the students know how to apply their knowledge to their work or vocation in a professional way and that they possess the competences that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study			
A3	That the students have the capability to gather and interpret relevant data (usually within their area of study) to issue judgments that include a reflection on relevant social, scientific or ethical issues			
A5	That the students develop those learning capabilities necessary to undertake further studies with a high degree of autonomy.			
B6	Capability to participate in flight testing programs for take-off and landing distances, ascent speeds, loss speeds, maneuverability and landing capacities.			
C23	Appropriate knowledge applied to engineering: physical phenomena of flight, its qualities and its control, aerodynamics, propulsive forces, active control and stability.			
C26	Applied knowledge of aerodynamics; mechanics and thermodynamics, flight mechanics, aircraft engineering (fixed and rotary wings), theory of structures.			
C31	Appropriate knowledge applied to engineering: physical phenomena of air defense systems, their qualities and their control, stability and automatic control systems.			
C33	Applied knowledge of aerodynamics, flight mechanics, air defense engineering (ballistics, missiles and air systems), space propulsion, material science and technology, structure theory.			
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			
D11	Show motivation for quality with sensitivity towards subjects within the scope of the studies			

Expected results from this subject				
Expected results from this subject	Training and Learning Results			
Knowledge of the most stood out appearances of the qualities of flight and the essays in flight of the aircraft	A5	B6	C23 C33	D8 D11
Knowledge, understanding, application, analysis and synthesis of the performances, the stability and controlabilidad static and dynamic of the aircraft.	A2 A3		C26 C31	D3 D4 D5 D6

Contents	
Topic	
1. Introduction to the mechanics of flight.	1.1. Introduction to the mechanics of flight. 1.2. Systems of reference and angles in mechanics of flight. 1.3. General equations of the movement.

2. Performances of gliders and aeroplanes propulsados by air jets and by alternative engines.	2.1. Performances of gliders 2.2. Performances of aeroplanes propulsados by air jets in horizontal rectilinear flight 2.3. Performances of aeroplanes propulsados by air jets in another type of flights 2.4. Performances of aeroplanes propulsados by alternative engines 2.5. Performances in takeoff and landing
3. Stability and static and dynamic control	3.1. Stability and longitudinal static control 3.2. Stability and lateral static control-directional 3.3. Introduction to the stability and dynamic control
4. Introduction to the Qualities of Flight and to the Essays in Flight.	4.1. Introduction to the Qualities of Flight and to the Essays in Flight.

Planning

	Class hours	Hours outside the classroom	Total hours
Problem solving	18	0	18
Lecturing	26.5	0	26.5
Autonomous problem solving	0	80	80
Mentored work	4	17.5	21.5
Objective questions exam	2.5	0	2.5
Objective 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
Problem solving	Resolution of problems and/or exercises that treat punctual appearances of the contents of the subject, developed by the professor and/or the students in the classroom.
Lecturing	Exhibition of a subject by part of the professor according to a previously established script
Autonomous problem solving	Study of the student of autonomous form, with the support of the professor if required according to the procedures established by the university
Mentored work	The tutoring work consists in the preparation of a project of design of an aircraft using the concepts learnt during the subject of mechanics of flight. It will be necessary on the other hand review key ideas of the subject of aerodynamics and aeroelasticidad. The work is of preparation in groups.

Personalized assistance

Methodologies	Description
Mentored work	The tutoring work consists in the preparation of a project of design of an aircraft using the concepts learnt during the subject of mechanics of flight. It will be necessary on the other hand review key ideas of the subject of aerodynamics and aeroelasticidad. The work is of preparation in groups.
Autonomous problem solving	Study of the student of autonomous form, with the support of the professor if required according to the procedures established by the university

Assessment

	Description	Qualification	Training and Learning Results			
Mentored work	The tutoring work consists in the preparation of a project of design	30	A2 A3 A5	B6	C23 C26 C31 C33	D4 D5 D6 D8 D11
Objective questions exam	Resolution of problems and/or conceptual questions on the contents of the subject	40	A2 A3 A5	B6	C23 C26 C31 C33	D3 D4 D5 D8 D11
Objective questions exam	Resolution of problems and/or conceptual questions on the contents of the subject	30	A2 A3 A5	B6	C23 C26 C31 C33	D3 D4 D5 D6 D8 D11

Other comments on the Evaluation

By default, the evaluation is assumed to be continuous. The student has the right to opt for the global evaluation according to the procedure and deadline established by the center for each call.

- Continuous assesment:

- At the first call:

- There will be a partial, liberating and retrievable exam during the course, with part of the contents of the subject. To pass said written test and release that part of the subject, it is necessary to obtain a grade of 5 out of 10; this part can be released if the grade exceeds 4 out of 10, and if the rest of the parts compensate the grade to exceed a final grade of 5 out of 10. The weight of this test in the final grade for this case is 30% .

- A final exam will be held on the official date indicated by the center. Said written test will consist of two parts: a first for students who have passed the partial exam, and with a weight of 40% in the final grade; a second part, for students who have not passed the partial exam (with its weight, of 30%)

- A group work will be carried out, with a weight of 30% in the final grade. Each member of the group can obtain a different qualification.

- The minimum grade to be achieved in any test will be 4 out of 10 to be able to balance the exam and practicals. To pass the subject, you must pass a weighted grade (written exams, work), of 5 out of 10. The written tests may consist of test-type questions and/or short questions and/or development questions.

- In the second call:

- Students who have not passed the subject at the first call will take an exam that will cover all aspects of the subject, on the official date indicated by the center.

- To pass the subject you must pass 5 out of 10. The exam may consist of test-type questions and/or short questions and/or development questions.

- Exam-only assesment/End-of-program callr:

- At the first call:

- A final exam will be held on the official date indicated by the center, which will cover all aspects of the subject.

- To pass the subject you must pass 5 out of 10. The exam may consist of test-type questions and/or short questions and/or development questions.

- In the second calll:

- The conditions are the same as in the case of continuous assesment.

In case of detection of plagiarism in any qualification item, the qualification in said item will be 0 and the fact will be communicated to the Center's management for the appropriate effects.

Sources of information

Basic Bibliography

Gómez Tierno M.A., Pérez Cortés M., and Puentes Márquez C., **Mecánica del vuelo**, 2, Ibergarceta Publicaciones S.L., 2012

Complementary Bibliography

PHILLIPS W., **Mechanics of Flight**, 2, John Wiley & Sons Ltd, 2009

Hull D.G., **Fundamentals of Airplane Flight Mechanics**, 1, Springer, 2007

Recommendations

Subjects that it is recommended to have taken before

Aerodynamics and aeroelasticity/O07G410V01923

IDENTIFYING DATA				
Aeronaves de á fixa e rotatoria				
Subject	Aeronaves de á fixa e rotatoria			
Code	007G410V01934			
Study programme	Grao en Enxeñaría Aeroespacial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	9	Optional	4	1c
Teaching language	Castelán			
Department				
Coordinator	Rey González, Guillermo David			
Lecturers	Rey González, Guillermo David			
E-mail	guillermo.rey@uvigo.es			
Web	http://aero.uvigo.es			
General description	Deseño de aeronaves de á fixa e rotatoria, coas súas tipoloxías, métodos de cálculo, estabilidade, control e sistemas.			

Resultados de Formación e Aprendizaxe	
Code	
A2	Que os estudantes saiban aplicar os seus coñecementos ao seu traballo ou vocación dunha forma profesional e posúan as competencias que adoitan demostrarse por medio da elaboración e defensa de argumentos e a resolución de problemas dentro da súa área de estudo
A3	Que os estudantes teñan a capacidade de reunir e interpretar datos relevantes (normalmente dentro da súa área de estudo) para emitir xuízos que inclúan unha reflexión sobre temas relevantes de índole social, científica ou ética
A5	Que os estudantes desenvolvesen aquelas habilidades de aprendizaxe necesarias para emprender estudos posteriores cun alto grao de autonomía
C24	Coñecemento adecuado e aplicado á Enxeñaría de: Os sistemas das aeronaves e os sistemas automáticos de control de voo dos vehículos aeroespaciais.
C25	Coñecemento adecuado e aplicado á Enxeñaría de: os métodos de cálculo de deseño e proxecto aeronáutico; o uso da experimentación aerodinámica e dos parámetros máis significativos na aplicación teórica; o manexo das técnicas experimentais, equipamento e instrumentos de medida propios da disciplina; a simulación, deseño, análise e interpretación de experimentación e operacións en voo; os sistemas de mantemento e certificación de aeronaves.
C26	Coñecemento aplicado de: aerodinámica; mecánica e termodinámica, mecánica do voo, enxeñaría de aeronaves (á fixa e ás rotatorias), teoría de estruturas.
D3	Capacidade de comunicación oral e escrita na lingua nativa
D4	Capacidade de aprendizaxe autónoma e xestión da información
D6	Capacidade de comunicación interpersoal
D8	Capacidade de razoamento crítico e autocrítico
D11	Ter motivación pola calidade con sensibilidade cara a temas do ámbito dos estudos

Resultados previstos na materia			
Expected results from this subject	Training and Learning Results		
Coñecemento, comprensión, aplicación, análise e síntese dos métodos de cálculo de deseño e proxecto de aeronaves de á fixa	A2	C24	D3
	A3	C25	D4
	A5	C26	D6
			D8
Coñecemento aplicado dos sistemas das aeronaves	A2	C24	D3
	A3	C25	D4
	A5	C26	D6
			D8
			D11
Coñecemento, comprensión, aplicación, da aerodinámica dos rotores, as actuacións e a estabilidade e controlabilidade das aeronaves das aeronaves de ás rotatorias	A2	C24	D3
	A3	C25	D4
	A5	C26	D6
			D8
			D11
Coñecemento dos aspectos máis destacados das calidades de voo e os ensaios en voo das aeronaves de ás rotatorias	A2	C24	D3
	A3	C25	D4
	A5	C26	D6
			D8
			D11

Contidos

Topic

Tema 1. Tipos de aeronaves de á fixa e rotatoria	Tema 1.1. Aeronaves de á fixa Tema 1.2. Aeronaves de á rotatoria
Tema 2. Introducción ás aeronaves de ás rotatorias	
Tema 3. Aerodinámica de rotores.	Tema 3.1. Voo axial Tema 3.2. Voo en avance
Tema 4. Actuacións de aeronaves de ás rotatorias	
Tema 5. Introducción á estabilidade e controlabilidade das aeronaves de ás rotatorias	
Tema 6. Introducción ás Calidades de Voo e aos Ensaíos en Voo das aeronaves de ás rotatorias	
Tema 7. Métodos de deseño preliminar de aeronaves de á fixa e rotatoria	
Tema 8. Arquitectura e deseño de compoñentes de aeronaves de á fixa	Tema 8.1. Fuselaxes Tema 8.2. Ás Tema 8.3. Superficies estabilizadoras Tema 8.4. Trens de aterraxe
Tema 9. Sistemas de aeronaves de á fixa	

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	30	68	98
Aprendizaxe baseado en proxectos	30	60	90
Resolución de problemas	8	8	16
Prácticas de laboratorio	7	10.5	17.5
Presentación	0.5	0	0.5
Exame de preguntas obxectivas	3	0	3

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

Metodoloxía docente

	Description
Lección maxistral	Exposición por parte do profesor/a dos contidos sobre a materia obxecto de estudo, bases teóricas e/ou directrices dun traballo, exercicio que o/a estudante ten que desenvolver.
Aprendizaxe baseado en proxectos	O/A estudante, de maneira individual ou en grupo, elabora un documento sobre a temática da materia ou prepara seminarios, investigacións, memorias, ensaios, resumos de lecturas, conferencias etc.
Resolución de problemas	Actividade na que se formulan problema e/ou exercicios relacionados coa materia. O alumno debe desenvolver as solucións axeitadas ou correctas mediante a exercitación de rutinas, a aplicación de fórmulas ou algoritmos, a aplicación de procedementos de transformación da información dispoñible e a interpretación dos resultados. Adóitase empregar como complemento da lección maxistral.
Prácticas de laboratorio	Actividades de aplicación dos coñecementos a situacións concretas e de adquisición de habilidades básicas e procedementais relacionadas coa materia obxecto de estudo. Desenvólvense en espazos especiais con equipamento especializado (Laboratorios, aulas informáticas, etc...)

Atención personalizada

Methodologies	Description
Lección maxistral	No ámbito da acción tutorial, distínguense accións de tutoría académica, así como de tutoría personalizada. No primeiro dos casos, o alumnado terá á súa disposición horas de tutorías nas que pode consultar calquera dúbida relacionada cos contidos, organización e planificación da materia, co desenvolvemento do proxecto, etc. As tutorías poden ser individualizadas, pero fomentaranse tutorías grupais para a resolución de problemas relacionados coas actividades para realizar en grupo, ou simplemente para informar o docente da evolución do traballo colaborativo. Nas tutorías personalizadas, cada alumno, de maneira individual, poderá comentar co profesor calquera problema que lle estea impedindo realizar un seguimento adecuado da materia, co fin de atopar entre ambos algúns tipos de solución. Conxugando ambos os tipos de acción tutorial, preténdense compensar os diferentes ritmos de aprendizaxe mediante a atención á diversidade.

Aprendizaxe baseado en proxectos	No ámbito da acción tutorial, distínguense accións de tutoría académica, así como de tutoría personalizada. No primeiro dos casos, o alumnado terá á súa disposición horas de tutorías nas que pode consultar calquera dúbida relacionada cos contidos, organización e planificación da materia, co desenvolvemento do proxecto, etc. As tutorías poden ser individualizadas, pero fomentaranse tutorías grupais para a resolución de problemas relacionados coas actividades para realizar en grupo, ou simplemente para informar o docente da evolución do traballo colaborativo. Nas tutorías personalizadas, cada alumno, de maneira individual, poderá comentar co profesor calquera problema que lle estea impedindo realizar un seguimento adecuado da materia, co fin de atopar entre ambos algúns tipos de solución. Conxugando ambos os tipos de acción tutorial, preténdense compensar os diferentes ritmos de aprendizaxe mediante a atención á diversidade.
Prácticas de laboratorio	No ámbito da acción tutorial, distínguense accións de tutoría académica, así como de tutoría personalizada. No primeiro dos casos, o alumnado terá á súa disposición horas de tutorías nas que pode consultar calquera dúbida relacionada cos contidos, organización e planificación da materia, co desenvolvemento do proxecto, etc. As tutorías poden ser individualizadas, pero fomentaranse tutorías grupais para a resolución de problemas relacionados coas actividades para realizar en grupo, ou simplemente para informar o docente da evolución do traballo colaborativo. Nas tutorías personalizadas, cada alumno, de maneira individual, poderá comentar co profesor calquera problema que lle estea impedindo realizar un seguimento adecuado da materia, co fin de atopar entre ambos algúns tipos de solución. Conxugando ambos os tipos de acción tutorial, preténdense compensar os diferentes ritmos de aprendizaxe mediante a atención á diversidade.
Resolución de problemas	No ámbito da acción tutorial, distínguense accións de tutoría académica, así como de tutoría personalizada. No primeiro dos casos, o alumnado terá á súa disposición horas de tutorías nas que pode consultar calquera dúbida relacionada cos contidos, organización e planificación da materia, co desenvolvemento do proxecto, etc. As tutorías poden ser individualizadas, pero fomentaranse tutorías grupais para a resolución de problemas relacionados coas actividades para realizar en grupo, ou simplemente para informar o docente da evolución do traballo colaborativo. Nas tutorías personalizadas, cada alumno, de maneira individual, poderá comentar co profesor calquera problema que lle estea impedindo realizar un seguimento adecuado da materia, co fin de atopar entre ambos algúns tipos de solución. Conxugando ambos os tipos de acción tutorial, preténdense compensar os diferentes ritmos de aprendizaxe mediante a atención á diversidade.

Avaliación						
	Description	Qualification	Training and Learning Results			
Aprendizaxe baseado en proxectos	Realización dun proxecto de deseño de aeronave de á fixa ou rotatoria. Parte do traballo está coordinado co proxecto de aerodinámica e aeroelasticidade.	20	A2	C24	D3	
			A3	C25	D4	
			A5	C26	D6	
					D8	
					D11	
Prácticas de laboratorio	Resolución de problemas e casos prácticas expostos nas sesións de prácticas. Parte do traballo está coordinado co proxecto de aerodinámica e aeroelasticidad.	20	A2	C24	D3	
			A3	C25	D4	
			A5	C26	D8	
Presentación	Presentación en clase do traballo grupal desenvolvido.	20	A2	C24	D3	
			A3	C25	D4	
			A5	C26	D6	
Exame de preguntas obxectivas	Exame de problemas	40	A2	C24	D3	
			A3	C25	D4	
			A5	C26	D8	

Other comments on the Evaluation

O calendario de probas de avaliación atópase publicado na páxina Web do centro.

Primeira oportunidade.

(1) Estudantes que seguen o curso por Avaliación Continua.

Para poder superar a materia na primeira oportunidade, mediante Avaliación Continua, será necesario:

-Unha nota, no exame final de avaliación continua de, como mínimo, un 4.0.

-Asistir a, como mínimo, o 90% das sesións de prácticas.

-Entregar a totalidade de memorias prácticas e traballos da materia obtendo, como mínimo, unha nota de 3 en cada un deles.

No caso de non cumprir ditas condicións a nota final será a resultante do mínimo da nota media de AC e de 4.9.

(2) Estudante que desexen ser avaliados mediante avaliación global.

A avaliación do curso na primeira oportunidade realizarase, por defecto, mediante Avaliación Continua. O estudantado ten dereito a optar pola avaliación global segundo o procedemento e o prazo que estableza o centro para cada convocatoria.

A nota obtida neste exame representará o 100% da nota final. O estudante deberá obter unha nota mínima de 5.0 neste exame. Este exame pode ter unha parte para realizar nunha sala de computadores e / ou laboratorio, e comprenderá a totalidade da materia impartida, así como os contidos abordados en todas as sesións prácticas e traballos.

Segunda oportunidade e Fin de Carrera.

O estudantado que non superase a materia na primeira oportunidade poderá realizarán un exame que supoñerá o 100% da nota. O estudante deberá obter unha nota mínima de 5.0 neste exame. Este exame pode ter unha parte para realizar nunha sala de computadores e / ou laboratorio, e comprenderá a totalidade da materia impartida, así como os contidos abordados en todas as sesións prácticas e traballos.

En caso de detección de plaxio en calquera elemento de cualificación, a cualificación na devandita entrega será 0 e o feito será comunicado á dirección do Centro para os efectos oportunos.

Bibliografía. Fontes de información

Basic Bibliography

Álvaro Cuerva Tejero, **Teoría de los Helicópteros**, 978-84-1545-221-8, 2, Ibergaceta Publicaciones, 2012

Raymond W. Prouty, **Helicopter Performance Stability and Control**, 978-0894649295, Revised edición, Krieger Publishing Company, 1995

Daniel P. Raymer, **Aircraft Design: A conceptual approach**, 978-1-62410-490-9, 6, American Institute of Aeronautics and Astronautics, 2020

Complementary Bibliography

Lloyd R. Jenkinson, James F. Marchman III, **Aircraft Design Projects**, Butterworth-Heinemann, 2003

David W. Hall, P.E., **Aircraft Conceptual And Preliminary Design**, San Luis Obispo California, 2000

Darrol Stinton, **The Design Of The Airplane**, Granada Publishing,

Recomendacións

Subjects that are recommended to be taken simultaneously

Mecánica do voo/O07G410V01924

Subjects that it is recommended to have taken before

Aerodinámica e aeroelasticidade/O07G410V01923

IDENTIFYING DATA				
Maintenance and certification of aerospace vehicles				
Subject	Maintenance and certification of aerospace vehicles			
Code	007G410V01935			
Study programme	Grado en Ingeniería Aeroespacial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	9	Optional	4th	1st
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Ulloa Sande, Carlos			
Lecturers	Gómez San Juan, Alejandro Manuel Ulloa Sande, Carlos			
E-mail	carlos.ulloa@uvigo.es			
Web	http://aero.uvigo.es			
General description	Airworthiness is the ability of aircraft to fly. This quality is ensured through certification, which is made up of a set of tasks that guarantee that the aircraft is in safe conditions for the flight. To ensure that these conditions are maintained over time, we must speak of continuing airworthiness, that is, all the revisions, modifications and maintenance tasks necessary to maintain airworthiness over time. This subject deals with the procedures that affect airworthiness, basically analyzing the EASA and FAA regulations. 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.			

Training and Learning Results

Code	
A2	That the students know how to apply their knowledge to their work or vocation in a professional way and that they possess the competences that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study
A3	That the students have the capability to gather and interpret relevant data (usually within their area of study) to issue judgments that include a reflection on relevant social, scientific or ethical issues
A5	That the students develop those learning capabilities necessary to undertake further studies with a high degree of autonomy.
B3	Installation, operation and maintenance in the field of aeronautical engineering (in accordance with what is established in section 5 of order CIN / 308/2009), aerospace vehicles, aerospace propulsion systems, aerospace materials, infrastructures and airports, air navigation infrastructures and space management, air traffic and transport management systems.
B4	Verification and certification in the field of aeronautical engineering that aim, in accordance with the knowledge acquired (in accordance with what is established in section 5 of order CIN / 308/2009), aerospace vehicles, aerospace propulsion systems, aerospace materials, airport infrastructures, air navigation infrastructures and space management, air traffic and transport management systems.
C21	Appropriate knowledge applied to engineering: foundations of sustainability, maintenance and operation of aerospace vehicles.
C25	Appropriate knowledge applied to engineering: methods of design calculations and aeronautical projects; use of aerodynamic experimentation and the most significant parameters in the theoretical application; management of experimental techniques, equipment and measuring instruments; simulation, design, analysis and interpretation of experimentation and operations in flight; systems of maintenance and certification of aircrafts.
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
D11	Show motivation for quality with sensitivity towards subjects within the scope of the studies
D13	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources

Expected results from this subject

Expected results from this subject	Training and Learning Results
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- Knowledge, understanding, application, analysis and synthesis of aircraft certification and maintenance methods.	A2	B3	C21	D3
	A3	B4	C25	D4
	A5			D5
				D6
				D8
				D11
				D13
- Applied knowledge of simulation, design, analysis and synthesis of experimentation and flight operations.	A2	B3	C21	D3
	A3	B4	C25	D4
	A5			D5
				D6
				D8
				D11
				D13

Contents

Topic	
Block 1: Certification	Unit 1.1: Introduction and concepts Unit 1.2: Organizations competent in airworthiness Unit 1.3: Airworthiness requirements Unit 1.4: The type certificate. The TC process. Unit 1.5: Production of articles, pieces and devices. Unit 1.6: Certificates of airworthiness Unit 1.7: Aircraft and operations certification codes Unit 1.8: Modification of aircraft Unit 1.9: Validation and tests of space vehicles
Block 2: Maintenance	Unit 2.1: Fundamentals of aeronautical maintenance Unit 2.2: Continuing airworthiness Unit 2.3: Management and types of maintenance Unit 2.4: Quality assurance and maintenance safety

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	33	0	33
Laboratory practical	20	10	30
Seminars	2	0	2
Previous studies	0	126.5	126.5
Mentored work	20	10	30
Objective questions exam	3.5	0	3.5

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

Methodologies

	Description
Lecturing	Classroom lectures
Laboratory practical	Labs using different testing techniques Conducting certification practices Case studies of accident investigation
Seminars	Tutoring in small groups
Previous studies	Autonomous work
Mentored work	Mentored work

Personalized assistance

Methodologies	Description
Seminars	Small group tutoring with the teachers of the subject. The tutorials will be held, by appointment, in the teacher's office or in the teacher's virtual office, on the Remote Campus.

Assessment

Description	Qualification	Training and Learning Results
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Laboratory practical	Laboratory report	10	A2 A3 A5	B3 B4	C21 C25	D3 D4 D5 D6 D8 D11 D13
Mentored work	Reports and presentations of the work proposed during the course of the course within the practical sessions	20	A2 A3	B3 B4	C21 C25	D3 D4 D5 D6 D8 D11 D13
Objective questions exam	Partial exam Certification of short questions and problems (35%)*	70	A2 A3 A5	B3 B4	C21 C25	D3 D4 D5 D8 D11 D13
	Partial exam Maintenance of short questions and problems (35%)*					D3 D4 D5 D8 D11 D13
	* In case of failing any of the partial exams, they must be repeated on the date of the final exam.					

Other comments on the Evaluation

First Call:

(1) Students who follow the course by Continuous Assessment:

In order to pass the subject at the first call, through Continuous Assessment, it will be necessary:

-A grade in each of the Continuous Assessment partial exams (Certification and Maintenance) of at least 5.0.

-Attend at least 80% of the practical sessions.

-Submit all the practical reports and assignments for the subject, obtaining at least a grade of 3 in each of them.

In the case of not meeting these conditions, the final mark will be the result of the minimum of the average mark of EC and 4.9.

Continuous assessment tests will be carried out during school hours, whenever possible. The final Continuous Assessment exam will be held on the date approved by the center for the first call.

(2) Students who wish to be evaluated by exam-only assessment:

The evaluation of the course at the first call will be carried out, by default, through Continuous Assessment. The student body has the right to opt for the exam-only assessment according to the procedure and the period established by the center for each call, which may not exceed one month.

The grade obtained in this exam will represent 100% of the final grade. The student must obtain a minimum grade of 5.0 in this exam. This exam may have a part to be taken in a computer room and/or laboratory, and will include all of the material taught, as well as the content covered in all the practical sessions and assignments.

The exam-only assessment exam will be carried out on the date approved by the center for the first call.

Second call and end-of-program call:

Students who have not passed the subject at the first call may take an exam that will account for 100% of the final grade. The student must obtain a minimum grade of 5.0 in this exam. This exam may have a part to be taken in a computer room and/or laboratory, and will include all of the material taught, as well as the content covered in all the practical sessions and assignments.

The second call and end-of-program exams will be held on the dates approved by the center for each call.

Other considerations:

In case of detection of plagiarism in any qualification element, the qualification in said item will be 0 and the fact will be communicated to the direction of the Center for the appropriate effects.

The evaluation test schedule officially approved by the Board of the EEAE Center is published on the website
<http://aero.uvigo.es/es/docencia/examenes>

Sources of information

Basic Bibliography

C. Cuerno Rejado, **Aeronavegabilidad y certificación de aeronaves**, 1, Paraninfo, 2008

F. de Florio, **Airworthiness. An introduction to aircraft certification and operations**, 3, Elsevier, 2016

H.A. Kinnison, **Aviation maintenance management**, 2, McGraw-Hill, 2013

EASA, **Especificaciones de Certificación europeas de EASA**,

FAA, **Regulaciones Federales de Aviación de la FAA (EE.UU.)**,

Complementary Bibliography

Recommendations

Subjects that it is recommended to have taken before

Aerospace technology/O07G410V01205

Air transport and airborne systems/O07G410V01404

Aerodynamics and aeroelasticity/O07G410V01923

IDENTIFYING DATA				
Control and optimization				
Subject	Control and optimization			
Code	007G410V01944			
Study programme	Grado en Ingeniería Aeroespacial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	Spanish Galician			
Department				
Coordinator	García Rivera, Matías			
Lecturers	García Rivera, Matías			
E-mail	mgrivera@uvigo.es			
Web	http://moovi.uvigo.gal			
General description	This subject presents different technics of analysis and design of control systems, using classical and modern control. The technics of optimization are applied in problems of design.			
	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.			

Training and Learning Results	
Code	
A2	That the students know how to apply their knowledge to their work or vocation in a professional way and that they possess the competences that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study
A3	That the students have the capability to gather and interpret relevant data (usually within their area of study) to issue judgments that include a reflection on relevant social, scientific or ethical issues
A5	That the students develop those learning capabilities necessary to undertake further studies with a high degree of autonomy.
C31	Appropriate knowledge applied to engineering: physical phenomena of air defense systems, their qualities and their control, stability and automatic control systems.
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
D11	Show motivation for quality with sensitivity towards subjects within the scope of the studies
D13	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources

Expected results from this subject			
Expected results from this subject		Training and Learning Results	
RA01: The students have a global vision of the methods of optimisation and its applications, in particular in the modern technics of optimum control.	A2	C31	D3
	A3		D4
	A5		D5
			D6
			D8
			D11
			D13

Contents
Topic
Introduction to optimization
Methods of multidimensional optimization
Optimization with constraints
Discrete and sampled systems
Design of PID controllers
State-Space
Linear-quadratic controller
State Estimation
Linear-quadratic gaussian controller
Minimum variance control

Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practical	18	0	18
Autonomous problem solving	0	87.5	87.5
Lecturing	32	0	32
Report of practices, practicum and external practices	0	10	10
Essay questions exam	1.25	0	1.25
Essay questions exam	1.25	0	1.25

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

Methodologies

	Description
Laboratory practical	Once developed the contents of theory and corresponding problems, students will make practices of laboratory.
Autonomous problem solving	Once developed the contents of theory and corresponding problems, students will resolve problems of autonomous form.
Lecturing	The lecturer will explain the main of the contents of the matter. Active participation of the students is required.

Personalized assistance

Methodologies	Description
Lecturing	The lecturer will advise the student with the items of theory given in classes
Laboratory practical	The lecturer will advise the student with the practices of laboratory

Assessment

	Description	Qualification	Training and Learning Results		
Laboratory practical	In this test concepts given in practices of laboratory will be evaluated. Learning outcomes evaluated RA01.	30	A2 A3 A5	C31	D3 D4 D5 D6 D8 D11 D13
Autonomous problem solving	The delivery of solutions to a set of exercises proposed evaluates the resolution of problems and/or exercises of autonomous form. Learning outcomes evaluated RA01.	5	A2 A3 A5	C31	D3 D4 D5 D6 D8 D11 D13
Report of practices, practicum and external practices	The delivery of this report of practices evaluates the assistance and active participation in the theoretical and practical classes and tutorship. Learning outcomes evaluated RA01.	5	A2 A3 A5	C31	D3 D4 D5 D6 D8 D11 D13
Essay questions exam	This test evaluates theoretical concepts and the resolution of problems. Learning outcomes evaluated RA01.	30	A2 A3 A5	C31	D3 D4 D5 D6 D8 D11 D13

Essay questions exam	(*)Esta proba avalía os coñecementos, competencias e habilidades ou destrezas acadados nas clases de teoría.	30	A2 A3 A5	C31	D3 D4 D5 D6 D8 D11 D13
	Esta proba realizarase o día fixado no calendario oficial de exames para a proba de avaliación global.				
	Esta proba non é recuperable.				
Resultado de aprendizaxe avaliado RA01.					

Other comments on the Evaluation

All references to numerical grades in this guide are about 10.

The dates of the final exams are published on the website of the EEAE in the web page

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

ASSESSMENT CRITERIA FOR ASSISTANT STUDENTS IN THE 1st EDITION OF ACTS

An assistant student is defined as the one who delivers the solutions to a series of exercises carried out autonomously and a practical report.

For a assistant students in the first edition of acts, the evaluation consists of:

- Examination of development questions. In this test theoretical concepts and problem solving related to the theory are evaluated. Represents 6 points of the final grade. In necessary to obtain a minimum of 3 points.
- Laboratory practices. In this test, concepts given in laboratory practices are evaluated. It represents 3 points of the final grade. In necessary obtain a minimum of 1.5 points.
- Delivery of the solutions to a series of proposed exercises carried out autonomously. Represents 0.5 points of the final grade. In necessary obtain a minimum of 0.25 points.
- Delivery of a practice report. Represents 0.5 points of the final grade. In necessary obtain a minimum of 0.25 points.

In the case of not reaching the required minimum in any of the parts, the subject will not be approved, and the final grade of the subject will never exceed the grade of 4.9.

EVALUATION CRITERIA FOR NON ASSISTANT STUDENTS IN THE 1st EDITION OF ACTS

For non assistant students in the first edition of the proceedings, the evaluation consists of:

- Examination of development questions. In this test theoretical concepts and problem solving related to the theory are evaluated. Represents 6.5 points of the final grade. In necessary obtain a minimum of 3.25 points.
- Evaluation of laboratory practices. In this test concepts given in laboratory practices are evaluated. It represents 3.5 points of the final grade. In necessary obtain a minimum of 1.75 points.

In the case of not reaching the required minimum in any of the parts, the subject will not be approved, and the final grade of the subject will never exceed the grade of 4.9.

ASSESSMENT CRITERIA FOR ASSISTANT AND NON ASSISTANT STUDENTS IN 2nd EDITION OF ACTS

For all students, non assistant and assistant, in the second edition of the acts the evaluation consists of:

- Examination of development questions. In this test theoretical concepts and problem solving related to the theory are evaluated. Represents 6.5 points of the final grade. In necessary obtain a minimum of 3.25 points.
- Evaluation of laboratory practices. In this test, concepts given in laboratory practices are evaluated. It represents 3.5 points of the final grade. In necessary obtain a minimum of 1.75 points.

In the case of not reaching the required minimum in any of the parts, the subject will not be approved, and the final grade of the subject will never exceed the grade of 4.9.

GRADING PROCESS

In the case of not reaching the required minimum in any of the parts, the subject will not be approved, and the final grade of the subject will never exceed the grade of 4.9.

PROHIBITION OF USE OF ANY ELECTRONIC DEVICE

Students are reminded of the prohibition of the use of any electronic device in the evaluation tests, in compliance with article 13.2.d) of the Statute of University Students, related to the duties of university students, which establishes the duty

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

JUSTIFICATION OF ABSENCE To be able to justify the absence to a test is necessary a Proof of Absence or a Consultation and Hospitalization Proof (also called P10) issued by a SERGAS doctor, or a certificate issued by a medical collegiate. A proof of the doctor's appointment will not be valid.

Sources of information

Basic Bibliography

Domínguez, S.; Campoy, P.; Sebastián, J.M.; Jiménez, A., **CONTROL EN EL ESPACIO DE ESTADO**, 2a, Pearson Educación S.A., Madrid,, 2006

K. OGATA, **Ingeniería de control moderna**, 5a, PRENTICE-HALL, 2010

B. C. KUO, **Sistemas de control automático**, 7a, PRENTICE HALL, 1996

R. FLETCHER, **Methods of Optimization**, John Wiley & Sons, 2007

Complementary Bibliography

Moreno, Garrido, Balaguer, **Ingeniería de Control: modelado y control de sistemas dinámicos**, Ariel, 2003

Recommendations

Subjects that it is recommended to have taken before

Electronics and automation/O07G410V01403

IDENTIFYING DATA				
Propulsion systems				
Subject	Propulsion systems			
Code	007G410V01945			
Study programme	Grado en Ingeniería Aeroespacial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Ulloa Sande, Carlos			
Lecturers	Ulloa Sande, Carlos			
E-mail	carlos.ulloa@uvigo.es			
Web	http://aero.uvigo.es			
General description	The matter treats on the problems of development of the systems of propulsion used in aircraft and missiles. The systems of aeronautical and space propulsion are required to make a big variety of missions, covering from the very small push during several years of performance, characteristic of some systems of propulsion employed in satellites, until the very big push acting during time very short, like the thrusters of a space launcher or of an intercontinental ballistic missile. English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results	
Code	
A2	That the students know how to apply their knowledge to their work or vocation in a professional way and that they possess the competences that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study
A3	That the students have the capability to gather and interpret relevant data (usually within their area of study) to issue judgments that include a reflection on relevant social, scientific or ethical issues
A5	That the students develop those learning capabilities necessary to undertake further studies with a high degree of autonomy.
B1	Capability for design, development and management in the field of aeronautical engineering (in accordance with what is established in section 5 of order CIN / 308/2009), aerospace vehicles, aerospace propulsion systems, aerospace materials, airport infrastructures, air navigation infrastructures and space management, air traffic and transport management systems.
C29	Appropriate knowledge applied to engineering: concepts and laws that govern the internal combustion, its application to rocket propulsion.
C33	Applied knowledge of aerodynamics, flight mechanics, air defense engineering (ballistics, missiles and air systems), space propulsion, material science and technology, structure theory.
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
D11	Show motivation for quality with sensitivity towards subjects within the scope of the studies
D13	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources

Expected results from this subject	
Expected results from this subject	Training and Learning Results
- To know the propulsive needs of the aircraft.	A2 B1 C29 D3 A3 C33 D4 A5 D5 D6 D8 D11 D13
- To know the thrusts and resistances related to the jet engines.	A2 B1 C29 D3 A3 D4 A5 D5 D6 D8 D11 D13

- To know and quantify in an applied way the combustion process of the jet engines and the combustion efficiency.	A2 A3 A5	B1	C29	D4 D5 D8 D11 D13
- To know how to perform an energy balance by differentiating and calculating the returns involved.	A2 A3 A5	B1	C29	D4 D5 D8 D11 D13
- To know how to solve problems related to the calculation of thermodynamic cycles and the characteristics of the jetreactors; as well as the effect of the characteristics and quality of the components.	A2 A3 A5	B1	C29	D4 D5 D8 D11 D13
- To know the different jet engines and know how to obtain the optimal systems from the point of view of propulsive.	A2 A3 A5	B1	C29	D3 D4 D5 D11 D13
- To size the components that intervene in the propulsive system.	A2 A3 A5	B1	C33	D4 D5 D8
- To use computer tools to calculate the performance of air-reactors.	A2 A3 A5	B1	C29	D4 D5 D8
- To know the effect of flight conditions: speed and altitude in the operation of the air-reactors.	A2 A3 A5	B1	C33	D4 D8
- To know the environmental problems of the jet engines and their possible solutions.	A2 A3 A5	B1	C29	D4 D13
- To write technical reports and make oral technical presentations related to the above.	A2 A3 A5	B1	C29 C33	D3 D6 D8 D11 D13
- To solve problems derived from the field of the subject in an autonomous way and in collaboration with others.	A2 A3 A5	B1	C29 C33	D5 D6 D8
- Knowledge and understanding of the laws that govern the movement of vehicles propelled with rocket engines; the generation of thrust and the variables on which it depends.	A2 A3	B1	C29	D4 D8
- Knowledge, understanding, application and analysis of the ideal model of the rocket engines with fluid dynamics propulsion and the influence of real effects.	A2 A3 A5	B1	C29 C33	D4 D5 D8
- Knowledge of the propellants and understanding and the combustion process of the rocket motors of solid, liquid and hybrid propellants.	A2 A3 A5	B1	C29	D4 D8
- Knowledge, understanding, application and analysis of the ionization and acceleration system of electric rocket motors.	A2 A3 A5	B1	C33	D4 D8
- Knowledge, understanding, application and analysis of the feeding and cooling systems.	A2 A3 A5	B1	C33	D4 D8
- To train to understand and simulate the physical-mathematical processes of rocket engines and to address both the problem of actions such as the synthesis or design.	A2 A3 A5	B1	C29 C33	D4 D5 D8

Contents

Topic	
Block 1: Introduction	Unit 1.1: Introduction to aircraft propulsion systems. Unit 1.2: Alternative engines. Unit 1.3: Turbo-propeller and turbo-shaft.
Block 2: Rockets	Unit 2.1: Introduction Unit 2.2: Description and operating principles Unit 2.3: Chemical rockets Unit 2.4: Electric propulsion

Block 3: Turbojet and turbofan

Topic 3.1: Turbojet and turbofan Engine Overview
 Topic 3.2: Operation of the jet engine
 Topic 3.3: Intake diffusers
 Topic 3.4: Compressors
 Topic 3.5: Combustion chambers
 Topic 3.6: Turbines
 Topic 3.7: Nozzles
 Topic 3.8: Parametric analysis of turbojet and turbofan

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	28	0	28
Laboratory practical	12	6	18
Seminars	0	2	2
Previous studies	0	79.5	79.5
Mentored work	10	10	20
Objective 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	Classroom lectures
Laboratory practical	Labs with different propulsion systems Simulation labs of propulsion systems Essays assignments on propulsion systems
Seminars	Tutoring in small groups
Previous studies	Autonomous work
Mentored work	Mentored work

Personalized assistance

Methodologies	Description
Seminars	Small group tutoring with the teachers of the subject. The tutorials will be held, by appointment, in the teacher's office or in the teacher's virtual office, on the Remote Campus.

Assessment						
	Description	Qualification	Training and Learning Results			
Laboratory practical	Laboratory report	10	A2 A3 A5	B1	C29 C33	D3 D4 D5 D6 D8 D11 D13
Mentored work	Reports and presentations of the work proposed during the course of the course within the practical sessions	20	A2 A3 A5	B1	C29 C33	D3 D4 D5 D6 D8 D11 D13
Objective questions exam	Partial exam of short questions and problems (30%) (Percentage can be divided into shorter tests) Final exam of short questions and problems (40%)	70	A2 A3 A5	B1	C29 C33	D3 D4 D5 D8 D11 D13

Other comments on the Evaluation

First Call:

(1) Students who follow the course by Continuous Assessment:

In order to pass the subject at the first call, through Continuous Assessment, it will be necessary:

- A grade in the Continuous Assessment final exam of at least 5.0.
- Attend at least 80% of the practical sessions.
- Submit all the practical reports and assignments for the subject, obtaining at least a grade of 3 in each of them.

In the case of not meeting these conditions, the final mark will be the result of the minimum of the average mark of EC and 4.9.

Continuous assessment tests will be carried out during school hours, whenever possible. The final Continuous Assessment exam will be held on the date approved by the center for the first call.

(2) Students who wish to be evaluated by exam-only assessment:

The evaluation of the course at the first call will be carried out, by default, through Continuous Assessment. The student body has the right to opt for the exam-only assessment according to the procedure and the period established by the center for each call, which may not exceed one month.

The grade obtained in this exam will represent 100% of the final grade. The student must obtain a minimum grade of 5.0 in this exam. This exam may have a part to be taken in a computer room and/or laboratory, and will include all of the material taught, as well as the content covered in all the practical sessions and assignments.

The exam-only assessment exam will be carried out on the date approved by the center for the first call.

Second call and end-of-program call:

Students who have not passed the subject at the first call may take an exam that will account for 100% of the final grade. The student must obtain a minimum grade of 5.0 in this exam. This exam may have a part to be taken in a computer room and/or laboratory, and will include all of the material taught, as well as the content covered in all the practical sessions and assignments.

The second call and end-of-program exams will be held on the dates approved by the center for each call.

Other considerations:

In case of detection of plagiarism in any qualification element, the qualification in said item will be 0 and the fact will be communicated to the direction of the Center for the appropriate effects.

The evaluation test schedule officially approved by the Board of the EEAE Center is published on the website <http://aero.uvigo.es/es/docencia/examenes>

Sources of information

Basic Bibliography

B. Galmés, **Motores de reacción y turbinas de gas**, 2, Paraninfo, 2018

J.D. Mattingly, **Elements of Propulsion: Gas Turbines and Rockets**, 2, AIAA Education Series, 2016

M. Cuesta, **Motores de reacción**, 9, Paraninfo, 2001

Complementary Bibliography

Y. Cengel, **Thermodynamics: An engineering approach**, 9 in SI, McGraw-Hill, 2019

Recommendations

Subjects that it is recommended to have taken before

Aerospace technology/O07G410V01205

Fluid mechanics/O07G410V01402

Thermodynamics/O07G410V01303

Fluid mechanics II and CFD/O07G410V01922

IDENTIFYING DATA				
Vehículos aeroespaciais				
Subject	Vehículos aeroespaciais			
Code	007G410V01946			
Study programme	Grao en Enxeñaría Aeroespacial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4	1c
Teaching language	Castelán			
Department				
Coordinator	Rey González, Guillermo David			
Lecturers	Rey González, Guillermo David			
E-mail	guillermo.rey@uvigo.es			
Web	http://aero.uvigo.es			
General description	A materia comprende o estudo do deseño preliminar de vehículos aeroespaciais. Faise unha análise xeral dos subsistemas e profúndase nos de análises de misión, control térmico, potencia, control de orientación, e estrutural. Así mesmo faise unha introdución aos sistemas de navegación e guiado de vehículos propulsados por motor foguete.			

Resultados de Formación e Aprendizaxe

Code				
A2	Que os estudantes saiban aplicar os seus coñecementos ao seu traballo ou vocación dunha forma profesional e posúan as competencias que adoitan demostrarse por medio da elaboración e defensa de argumentos e a resolución de problemas dentro da súa área de estudo			
A3	Que os estudantes teñan a capacidade de reunir e interpretar datos relevantes (normalmente dentro da súa área de estudo) para emitir xuízos que inclúan unha reflexión sobre temas relevantes de índole social, científica ou ética			
A5	Que os estudantes desenvolven aquelas habilidades de aprendizaxe necesarias para emprender estudos posteriores cun alto grao de autonomía			
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.			
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, maniobrabilidade e capacidades de aterraxe.			
C27	Coñecemento adecuado e aplicado á Enxeñaría de: Os fundamentos de sustentabilidade, mantenibilidade e operatividade dos sistemas espaciais.			
C32	Coñecemento adecuado e aplicado á Enxeñaría de: Os métodos de cálculo e de desenvolvemento dos materiais e sistemas da defensa; o manexo das técnicas experimentais, equipamento e instrumentos de medida propios da disciplina; a simulación numérica dos procesos físico-matemáticos máis significativos; as técnicas de inspección, de control de calidade e de detección de fallos; os métodos e técnicas de reparación máis adecuados.			
C33	Coñecemento aplicado de: aerodinámica; mecánica do voo, enxeñaría da defensa aérea (balística, mísiles e sistemas aéreos), propulsión espacial, ciencia e tecnoloxía dos materiais, teoría de estruturas.			
D3	Capacidade de comunicación oral e escrita na lingua nativa			
D4	Capacidade de aprendizaxe autónoma e xestión da información			
D6	Capacidade de comunicación interpersoal			
D8	Capacidade de razoamento crítico e autocrítico			
D11	Ter motivación pola calidade con sensibilidade cara a temas do ámbito dos estudos			
D13	Sustentabilidade e compromiso ambiental. Uso equitativo, responsable e eficiente dos recursos			

Resultados previstos na materia

Expected results from this subject	Training and Learning Results			
Coñecemento, comprensión, aplicación e análise do deseño preliminar de aeronaves	A2	B1	C27	D4
	A3	B6	C32	D8
	A5		C33	D11
Coñecemento, comprensión e aplicación das configuracións, subsistemas e misións dos mísiles e vehículos espaciais.	A2	B1	C27	D3
	A3	B6	C32	D4
	A5		C33	D6
				D8
				D11
				D13

Coñecemento, comprensión, aplicación e análise do deseño aerodinámico e guiado de mísiles e vehículos espaciais.	A2	B1	C27	D3
	A3		C32	D4
	A5		C33	D6
				D8
				D11
				D13

Contidos

Topic	
Tema 1. Aeronaves	Tema 1.1. Deseño preliminar de aeronaves de á fixa. Tema 1.2. Deseño preliminar de aeronaves de á rotatoria
Tema 2. Mísiles	Tema 2.1. Tipos e clasificación de mísiles. Tema 2.2. Subsistemas de navegación, guiado e control de mísiles
Tema 3. Vehículos espaciais.	Tema 3.1. Tipos e clasificación de vehículos espaciais. Tema 3.2. Análise de misión. Tema 3.3. Análise xeral dos subsistemas. Tema 3.4. Subsistema de control térmico. Tema 3.5. Subsistema de control de actitude e órbita

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	24	52	76
Resolución de problemas	10	31.5	41.5
Prácticas de laboratorio	14	14	28
Exame de preguntas obxectivas	2	0	2
Exame de preguntas obxectivas	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.

Metodoloxía docente

	Description
Lección maxistral	Exposición dun tema por parte do profesorado segundo un guión previamente establecido
Resolución de problemas	Resolución de problemas e/ou exercicios que tratan aspectos puntuais dun subsistema, e que á súa vez todos xuntos abordan un problema máis global dese subsistema de vehículos aeroespaciais.
Prácticas de laboratorio	Realización de prácticas relacionadas co temario da materia. A realización das prácticas require a preparación das mesmas, a asistencia e a realización dun informe por parte do estudantado.

Atención personalizada

Methodologies	Description
Lección maxistral	No ámbito da acción titotial, distínguense accións de tutoría académica, así como de tutoría personalizada. No primeiro dos casos, o estudantado terá á súa disposición horas de tutorías nas que pode consultar calquera dúbida relacionada cos contidos, organización e planificación da materia, co desenvolvemento do proxecto, etc. As tutorías poden ser individualizadas, pero fomentaranse tutorías grupais para a resolución de problemas relacionados coas actividades a realizar en grupo, ou simplemente para informar ao docente da evolución do traballo colaborativo. Nas tutorías personalizadas, cada alumno, de maneira individual, poderá comentar co profesor calquera problema que lle estea impedindo realizar un seguimento adecuado da materia, co fin de atopar entre ambos algúns tipos de solución. Conxugando ambos os tipos de acción tutorial, preténdense compensar os diferentes ritmos de aprendizaxe mediante a atención á diversidade.
Resolución de problemas	No ámbito da acción titotial, distínguense accións de tutoría académica, así como de tutoría personalizada. No primeiro dos casos, o estudantado terá á súa disposición horas de tutorías nas que pode consultar calquera dúbida relacionada cos contidos, organización e planificación da materia, co desenvolvemento do proxecto, etc. As tutorías poden ser individualizadas, pero fomentaranse tutorías grupais para a resolución de problemas relacionados coas actividades a realizar en grupo, ou simplemente para informar ao docente da evolución do traballo colaborativo. Nas tutorías personalizadas, cada alumno, de maneira individual, poderá comentar co profesor calquera problema que lle estea impedindo realizar un seguimento adecuado da materia, co fin de atopar entre ambos algúns tipos de solución. Conxugando ambos os tipos de acción tutorial, preténdense compensar os diferentes ritmos de aprendizaxe mediante a atención á diversidade.

Avaliación

Description	Qualification	Training and Learning Results
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Prácticas de laboratorio	Avaliación da realización do informe.	30	A3 A5	B1 B6	C27 C32	D11
Exame de preguntas obxectivas	Exame de problemas e/o preguntas de desenvolvemento e/o tipo test	30	A2 A3 A5	B1 B6	C27 C32 C33	D3 D4 D6 D8 D11 D13
Exame de preguntas obxectivas	Exame de problemas e/o preguntas de desenvolvemento e/o tipo test	40	A2 A3 A5	B1 B6	C27 C32 C33	D3 D4 D8 D11 D13

Other comments on the Evaluation

.;O calendario de probas de avaliación atópase publicado na páxina Web do centro.

Primeira oportunidade.

(1) Estudantes que seguen o curso por Avaliación Continua.

Para poder superar a materia na primeira oportunidade, mediante Avaliación Continua, será necesario:

-Unha nota, no exame final de avaliación continua de, como mínimo, un 4.0.

-Asistir a, como mínimo, o 90% das sesións de prácticas.

-Entregar a totalidade de memorias prácticas e traballos da materia obtendo, como mínimo, unha nota de 3 en cada un deles.

No caso de non cumprir ditas condicións a nota final será a resultante do mínimo da nota media de AC e de 4.9.

(2) Estudante que desexen ser avaliados mediante avaliación global.

A avaliación do curso na primeira oportunidade realizarase, por defecto, mediante Avaliación Continua. O estudantado ten dereito a optar pola avaliación global segundo o procedemento e o prazo que estableza o centro para cada convocatoria.

A nota obtida neste exame representará o 100% da nota final. O estudante deberá obter unha nota mínima de 5.0 neste exame. Este exame pode ter unha parte para realizar nunha sala de computadores e / ou laboratorio, e comprenderá a totalidade da materia impartida, así como os contidos abordados en todas as sesións prácticas e traballos.

Segunda oportunidade e Fin de Carrera.

O estudantado que non superase a materia na primeira oportunidade poderá realizarán un exame que supoñerá o 100% da nota. O estudante deberá obter unha nota mínima de 5.0 neste exame. Este exame pode ter unha parte para realizar nunha sala de computadores e / ou laboratorio, e comprenderá a totalidade da materia impartida, así como os contidos abordados en todas as sesións prácticas e traballos.

En caso de detección de plaxio en calquera elemento de cualificación, a cualificación na devandita entrega será 0 e o feito será comunicado á dirección do Centro para os efectos oportunos.

Bibliografía. Fontes de información

Basic Bibliography

Fortescue P., Stark J., Swinerd G., **Spacecraft Systems Engineering**, 3, Wiley, 2003

Tewari A., **Advanced Control of Aircraft, Spacecraft and Rockets.**, 1, John Wiley & Sons, 2011, 2011

Larson W. J., Wertz J.R., **Space Mission Analysis and Design**, 3, Springer Netherlands, 1999

Complementary Bibliography

Gilmore D. G., **Spacecraft Thermal Control Handbook.**, 2, The Aerospace Press., 2002

Recomendacións

Subjects that are recommended to be taken simultaneously

Control e optimización/O07G410V01944

Subjects that it is recommended to have taken before

IDENTIFYING DATA				
Professional internships				
Subject	Professional internships			
Code	007G410V01981			
Study programme	Grado en Ingeniería Aeroespacial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Carou Porto, Diego			
Lecturers	Martín Ortega, Elena Beatriz			
E-mail	diecapor@uvigo.es			
Web	http://http://aero.uvigo.es/			
General description	By the realisation of practices in a company the student will be able to apply the knowledge and skills acquired during his/her studies, reinforcing his/her training and facilitating his/her incorporation to the labour market.			
	English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results

Code			
A2	That the students know how to apply their knowledge to their work or vocation in a professional way and that they possess the competences that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study		
A3	That the students have the capability to gather and interpret relevant data (usually within their area of study) to issue judgments that include a reflection on relevant social, scientific or ethical issues		
A4	That the students can transmit information, ideas, problems and solutions to a specialized and non-specialized audience		
A5	That the students develop those learning capabilities necessary to undertake further studies with a high degree of autonomy.		
C6	Adequate knowledge of the concept of a company, corporate and legal framework of a company. Organization and management of companies.		
C19	Applied knowledge of: science and technology of materials; mechanics and thermodynamics; fluid mechanics; aerodynamics and flight mechanics; navigation and air traffic systems; aerospace technology; theory of structures; airborne transportation; economy and production; projects; environmental impact.		
D2	Leadership, initiative and entrepreneurship		
D3	Capability of oral and written communication in native language		
D4	Capability of autonomous learning and information management		
D11	Show motivation for quality with sensitivity towards subjects within the scope of the studies		
D12	Ethical and democratic commitment		

Expected results from this subject

Expected results from this subject	Training and Learning Results		
Knowledge, understanding and application of the organization and planning of a company or institution of the aerospace sector.	C6		
Knowledge, understanding and application of work teams, oral and written communication skills at institutions of the aerospace sector	A3 A4 A5	D2 D3 D4 D11 D12	
Knowledge, understanding, application, analysis and synthesis of diverse technical problems that appear in the companies, applying with creativity the knowledge acquired during the student studies	A2	C19	D12

Contents

Topic

General knowledge of the organisation chart and lines of activity of the company or institution.

- Visit to the installations.
- To familiarize with the instrumentation, tools, programming languages and software packages used by the company
- Allocation of the student to a work group.
- Allocation of a work package to the student, such as present works of the company or its R&D lines.
- Realization of the work entrusted.
- Writing of a final report and the official documents required.

Planning

	Class hours	Hours outside the classroom	Total hours
Practicum, External practices and clinical practices	0	150	150

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

Methodologies

	Description
Practicum, External practices and clinical practices	Realization of the external practices in the organism/company inside the work group and task assigned

Personalized assistance

Methodologies	Description
Practicum, External practices and clinical practices	The students will keep in touch with the academic coordinator of the subject by sending regularly brief reports by email. In these reports, they will inform of any incidence and of the tasks developed within the company. It is recommended to send weekly reports

Assessment

	Description	Qualification	Training and Learning Results		
Practicum, External practices and clinical practices	Evaluation by the company supervisor during the development of the practices (25%)	100	A2	C6	D2
	Autoevaluation of the student (25%)		A3	C19	D3
	Evaluation of the memory of practices delivered by the student when finalising (25%)		A4		D4
	Evaluation of the report of the academic supervisor designated by the centre (25%)		A5		D11
	The students will keep in touch not only with the company supervisor, but also with the academic supervisor.				D12
	When concluding the practices, the students will have to deliver to his academic supervisor a final memory and also the official document Report of the student.				
	The evaluation will take into account the follow-up made by the academic tutor and the reports delivered by the student.				

Other comments on the Evaluation

This course follows the specific regulation of the School in this matter:

http://aero.uvigo.es/images/docs/escuela/normativa/Practicas_EEAE.pdf

Sources of information

Basic Bibliography

Complementary Bibliography

Recommendations

IDENTIFYING DATA				
Final Year Dissertation				
Subject	Final Year Dissertation			
Code	007G410V01991			
Study programme	Grado en Ingeniería Aeroespacial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	12	Mandatory	4th	2nd
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Ulloa Sande, Carlos			
Lecturers	Ulloa Sande, Carlos			
E-mail	carlos.ulloa@uvigo.es			
Web	http://aero.uvigo.es			
General description	The Final Degree Project (TFG) is an original and personal work that each student will carry out independently under the tutorship of the academic staff and will allow them to demonstrate, in an integrated manner, the acquisition of the knowledge and the competences associated with the degree. English Friendly subject: International students may request from the teachers: a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results	
Code	
A2	That the students know how to apply their knowledge to their work or vocation in a professional way and that they possess the competences that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study
A3	That the students have the capability to gather and interpret relevant data (usually within their area of study) to issue judgments that include a reflection on relevant social, scientific or ethical issues
A4	That the students can transmit information, ideas, problems and solutions to a specialized and non-specialized audience
A5	That the students develop those learning capabilities necessary to undertake further studies with a high degree of autonomy.
C34	Original exercise to be performed individually and presented and defended at a university jury, consisting of a project in the field of specific technologies of aerospace engineering with a professional nature in which the competences acquired during teaching are synthesized and integrated.
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	Capability for interpersonal communication
D7	Capability to adapt to new situations with creativity and innovation
D8	Capability for critical and self-critical reasoning
D9	Capability to work in interdisciplinary teams
D10	Capability to negotiate and deal with and act in situations of conflict
D11	Show motivation for quality with sensitivity towards subjects within the scope of the studies
D12	Ethical and democratic commitment
D13	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources

Expected results from this subject			
Expected results from this subject	Training and Learning Results		
Knowledge, understanding, application, analysis and synthesis of a project in the field of specific aerospace equipment and materials engineering technologies.	A2	C34	D2
	A3		D3
	A4		D4
	A5		D5
			D6
			D7
			D8
			D9
			D10
			D11
			D12
			D13

Contents
Topic
Knowing, understanding, application, analysis and synthesis of a project in the field of specific engineering technologies for aerospace equipment and materials.

Planning	Class hours	Hours outside the classroom	Total hours
Previous studies	0	90	90
Project based learning	0	120	120
Mentored work	20	0	20
Project	0	50	50
Presentation	1	19	20
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	Description
Previous studies	Autonomous work aimed at the acquisition of theoretical knowledge.
Project based learning	Oriented to practical application.
Mentored work	Dedication of the student at the facilities of the School of Aeronautical Engineering and Space: - Student assistance to the school laboratories for the development of the project. - Tutorials with the tutor and / or co-tutor. Meetings with the student dedicated to the application of methods and techniques, review of documents, presentation rehearsal, etc.

Personalized assistance	
Methodologies	Description
Mentored work	Tutorials with tutor and/or co-tutor

Assessment	Description	Qualification	Training and Learning Results
Project	Tutor evaluation of the project: 25%	75	A2 D2
	Academic tribunal evaluation: 50%		A3 D3
	- Evaluation of the scope of the project. The scientific-technical difficulty of the work will be evaluated (25%)		A4 D4
	- Evaluation of the documentation. The quality of the TFG memory will be evaluated (25%)		A5 D5
			D6
			D7
			D8
			D9
			D10
			D11
			D12
			D13
Presentation	Academic tribunal evaluation: 25%	25	A2 D2
	- Evaluation of the presentation. Aspects such as clarity in the presentation, use of time, quality of the material used and answering the questions of the tribunal members are evaluated.		A3 D3
			A4 D4
			A5 D5
			D6
			D7
			D8
			D9
			D10
			D11
			D12
			D13

Other comments on the Evaluation

The TFG is an original exercise that is carried out individually, is presented in front an academic tribunal. It must be a project in the field of specific technologies of Aerospace engineering, with a professional nature, in which students synthesize and

integrate the competences acquired during their studies. The performance and evaluation of the TFG is regulated by active regulations of University of Vigo and EEAE.

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****Complementary Bibliography**

Recommendations

Other comments

Ethical commitment: student must present a suitable ethical behaviour. If a no ethical behaviour (cheating, plagiarism, or others) is detected, a fail (0,0) will be the global mark for the student.

Requirements: Enrollment in TFG course must be done only if the students enroll in all the remaining subjects necessary to get their degree..

Important information: The TFG only can be presented and evaluated if there are objective evidence that the students passed all the other necessary subjects to obtain their degree, according to the University of Vigo TFG Regulation, approved on 5th of June of 2016 and modified on 13 of November of 2018.

Plagiarism will be prosecuted using plagiarism software tool.
