



(*)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

Pavillón Manuel Martínez-Risco

Campus universitario

32004 Ourense

Tel.: +34 988 368 823

Web: <http://aero.uvigo.es>

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

007G410V01935	Maintenance and certification of aerospace vehicles	1st	9
007G410V01944	Control and optimization	1st	6
007G410V01945	Propulsion systems	1st	6
007G410V01946	Aerospace Vehicles	1st	6
007G410V01981	Professional internships	2nd	6
007G410V01991	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	Enxeñaría mecánica, máquinas e motores térmicos e fluídos			
Coordinator	Rey González, Guillermo David			
Lecturers	Gómez San Juan, Alejandro Manuel 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.			

Competencias	
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 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.
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 de aprendizaxe

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
		B8		D6
				D8
				D9
				D10
				D11
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. Dirección empresarial: función directiva.

Xestión de recursos humanos e do coñecemento.

Tema 2. Xestión de Calidade. Xestión de Mercadotecnia.

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	31	63	94
Aprendizaxe baseado en proxectos	10	16.5	26.5
Estudo de casos	9	18	27
Exame de preguntas obxectivas	2	0	2
Presentación	0.5	0	0.5

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

Metodoloxía docente

	Description
Lección 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
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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	30	A2 A3 A4 A5	B1 B2 B4 B5 B7 B8	C19	D2 D3 D4 D5 D6 D8 D9 D11
Estudo de casos	Resolución de problemas e casos prácticos expostos nas sesións de prácticas	15	A2 A3 A5	B1 B2 B4 B5 B7 B8	C19	D3 D4 D5 D8 D11 D13
Exame de preguntas obxectivas	Exame tipo test	50	A2 A3 A5	B1 B2 B4 B5 B7 B8	C19	D3 D4 D5 D11 D13
Presentación	Presentación en clase do traballo en grupo desenvolvido.	5	A2 A3 A4 A5	B1 B2 B4 B5 B7 B8	C19	D2 D3 D4 D5 D6 D8 D9 D10 D11 D12 D13

Other comments on the Evaluation

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>

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, non inferior a 4.0.

-Entregar todas as 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 4.0.

(2) Estudante que, tras unha autorización por parte do profesorado, desexen ser avaliados mediante avaliación única:

A avaliación do curso na primeira oportunidade realizarase, por defecto, mediante Avaliación Continua.

Os estudantes que teñan unha xustificación poderán renunciar oficialmente á avaliación continua e realizar un só exame final, na data oficial. A nota obtida neste exame representará o 100% da nota final. O alumno deberá superar o 5 neste exame. Este exame pode ter unha parte para realizar nunha sala de computadores e / ou laboratorio.

A renuncia á avaliación continua debe facerse durante o primeiro mes de clase. Durante este período, presentarse o xustificante ao coordinador da materia para a súa avaliación.

Segunda oportunidade e Fin de Carreira

Os alumnos que non superasen a materia na primeira oportunidade poderán realizarán un exame que suporá o 100% da nota. Este exame pode ter unha parte para realizar nunha sala de computadores e / ou laboratorio.

En caso de detección de copia en calquera das probas (probas curtas, exames parciais ou exame final), a cualificación final será de SUSPENSO (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)**, 6, Project Management Institute, 2017

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

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

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

Complementary Bibliography

Recomendacións

Subjects that it is recommended to have taken before

Empresa: Administración da tecnoloxía e a empresa/O07G410V01204

Plan de Continxencias

Description

=== MEDIDAS EXCEPCIONAIS PLANIFICADAS ===

Ante a incerta e imprevisible evolución da alerta sanitaria provocada pola COVID-19, a Universidade establece unha planificación extraordinaria que se activará no momento en que as administracións e a propia institución determinen, atendendo a criterios de seguridade, saúde e responsabilidade, e garantindo a docencia nun escenario non presencial ou non totalmente presencial.

Estas medidas xa planificadas garanten, no momento que sexa preceptivo, o desenvolvemento da docencia dunha maneira mais áxil e eficaz ao ser coñecido de antemán (ou cunha ampla antelación) polo alumnado, e o profesorado, a través da ferramenta normalizada e institucionalizada das guías docentes DOCNET.

Escenario de docencia mixta

Debido á situación excepcional, ante a imposibilidade de poder impartir a docencia dun modo totalmente presencial, utilizaranse medios virtuais tanto síncronos como asíncronos para a impartición das clases que sexan habilitadas pola Universidade de Vigo.

As prácticas serán entregadas polos estudantes e avaliadas empregando os recursos das plataforma de teledocencia dispoñible no seu momento.

As sesións de tutorización, tanto o nivel individual como o nivel de grupos poderán realizarse por medios telemáticos (correo electrónico, videoconferencia, salgas/aulas/despachos virtuais proporcionadas pola Universidade de Vigo).

=== ADAPTACIÓN DAS METODOLOXÍAS ===

As metodoloxías docentes mantéñense principalmente cunha posible modificación temporal na planificación segundo a situación concreta.

Non procede ningunha modificacións dos contidos para impartir.

Auméntase a bibliografía co material de elaboración propia (por exemplo, guías de traballo, vídeos e textos explicativos, problemas resoltos, etc.) para facilitar a auto-aprendizaxe.

=== ADAPTACIÓN DA AVALIACIÓN ===

As probas mantéñense coas súas ponderacións previstas.

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	Arias Sánchez, Pedro González Jorge, Higinio			
E-mail	higiniog@uvigo.es			
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.			

Skills	
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	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

Learning outcomes	
Expected results from this subject	Training and Learning Results
Understanding of the need for aircraft navigation systems	A2 B1 C19 D3 A3 B6 D4 A5 D6 D8 D11
Understanding of the theoretical foundations and operation of aircraft navigation systems. Understanding of external agents that affect these systems.	A2 B1 C19 D3 A3 B6 D4 A5 D6 D8 D11
Understanding of the methods to ensure the proper working of these systems.	A2 B1 C19 D3 A3 B6 D4 A5 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 (ENAI). Air traffic management. Aeronautical information service (AIS).

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	24	0	24
Practices through ICT	24	25	49
Mentored work	2	75	77

*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. On-line tutorials. Attention by email.
Practices through ICT	Classroom attention. On-line tutorials. Attention by email.
Mentored work	On-line tutorials. Attention by email.

Assessment

	Description	Qualification	Training and Learning Results			
Lecturing	There will be two partial exams to test the theoretical content of the subject. Each one will have a weight of 25% in the global mark of the subject. Each exam will consist of a total of 30 questions.	50	A2 A3 A5	B1 B6	C19	D3 D4 D6 D8 D11
Practices through ICT	Each practice 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
Mentored work	The student must deliver a final report with the work done. In addition, the student must perform a presentation.	20	A2 A3 A5	B1 B6	C19	D3 D4 D6 D8 D11

Other comments on the Evaluation

The continuous evaluation tests will be carried out during university class hours.

The official exam dates are used for the student to take a comprehensive examination of the course if he/she does not follow the continuous evaluation 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 2.5 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

Contingency plan

Description

In prevention of a health alert caused by COVID-19, the following is established:

Theoretical, practical teaching and tutoring for students are planned to migrate if necessary to 100% virtual teaching, without the need for a physical presence in the classroom.

The evaluation tests will be carried out virtually using the MOOVI and Remote Campus tools.

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 Gutián Saco, María Beatriz			
Lecturers	Álvarez González, David Gutián Saco, María Beatriz			
E-mail	davidag@uvigo.es bea.guitian@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.			

Skills

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	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

Learning outcomes

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

Knowledge the economic and social profits of the aerial transport

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 Manufacture and optimisation of material properties. Termo-mechanical Treatments. Mechanical and thermal properties of alloys.
Subject 3. Composite materials.	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).	10	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).	10				
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.	60	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.	20	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 this 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 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

Contingency plan

Description

=== EXCEPTIONAL MEASURES SCHEDULED ===

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

=== ADAPTATION OF THE METHODOLOGIES ===

* Educational Methodologies that modify :

The no face-to-face teaching will take place by means of synchronous and asynchronous activities reinforcing so much the employment of the platform *Moovi like the use of the virtual classrooms of the University of Vigo, so that the student/to can reach without problem the total of the competitions prefixed with the lower possible change with regard to the face-to-face teaching.

* Mechanism of remote attention to the students (individual mentorship):

The individual mentorship will be made through the available telematic means in the University of Vigo employing of preferential way the virtual dispatch of the professor of the matter.

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

No modifications in the general contents of the matter.

* Additional bibliography to facilitate the car-learning:

In addition to the sources of information collected in the educational guide will include material of additional query like extracts of chapters of books as well as distinct links of audiovisual content related with each subject and in function of the evolution of the contents of the matter.

=== ADAPTATION OF THE EVALUATION ===

Because of the impossibility to make face-to-face proofs during the course, makes a modification of the system of evaluation of the educational guide with the aim to be able to make 100% of the evaluation of the matter by means of proofs of character no face-to-face. These will make by means of the distinct telematic means available along the course.

System of evaluation modified:

Practices of laboratory, reports of realisation of practices that the student/to will have to deliver of individual way or by groups with 20% of the final note.

Examination of objective questions, proof written in which the student/to will have to answer to relative questions to the matter with 40% of the final note.

Questionnaires or resolution of problems of individual way with 20% in the final note.

Individual oral presentation or by groups of a subject proposed during the development of the matter with 20% in the final note.

The student that renounce to the continuous evaluation by means of the distinct proofs of evaluation, will have right to the realisation of a final proof where will be able to obtain 100% of the qualification of the matter.

* Additional information

The corresponding data to schedules, classrooms and dates of examinations will be able to consult of up to date form in the web page of the centre: <http://aero.uvigo.es/gl/docencia/examenes>

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.			

Skills

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

Learning outcomes

Expected results from this subject	Training and Learning Results		
Understanding of the concept of engineering of systems.			
Knowledge, understanding, application, analysis and synthesis of the systems in real time of control of the aerospace vehicles.	A2 A3 A5	C24 C31	D11
Knowledge, understanding and application of the requests of the systems in real time to the basic systems of control of flight		C24	

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	29	60	89
Laboratory practical	13	16	29

Mentored work	6.5	23	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 D11 C31
Mentored work	Presentation and report on the mentored work	40	A2 A3 A5	C24 D11 C31
Objective questions examExamen		40	A2 A3 A5	C24 D11 C31

Other comments on the Evaluation

The calendar of evaluation tests officially approved by the Xunta de Centro of the EEAE is published on the website of the School (normally, at <http://aero.uvigo.es/gl/docencia/exames>)

First opportunity:

- 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 opportunity:

- Students who have not passed the subject in the first opportunity will take an extraordinary exam that will have the same format and the same requirements as the first opportunity. 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

Contingency plan

Description

The evaluation will be carried out, under normal conditions, under the indications reflected in this guide.

In the event of exceptional circumstances that impede the normal development of teaching, an online teaching will be chosen (whenever possible) via streaming (live), through the tools provided by the University of Vigo. The evaluation tests would be carried out, in this case, remotely with the tools of the University; the evaluation criteria will be maintained in non-classroom teaching, except for extraordinary reasons that totally prevent said option.

In the event that teaching is carried out in a mixed way, the evaluation criteria will be maintained as well, except for extraordinary reasons that make this option totally impossible. The evaluation tests would be carried out, in this case, remotely with the tools of the University.

In both cases, tutoring meetings will take place remotely via the tools provided by the University, in a moment subject to agreement between the teacher and the student.

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 Ferriz Mas, Antonio Vázquez Domínguez, Marta			
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.			

Skills	
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

Learning outcomes			
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 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	25	15	40
Autonomous problem solving	15	20	35
Practices through ICT	10	0	10
Presentation	1	5	6
Objective questions exam	2	30	32
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	(*)Presentación dun traballo en clases co obxectivo de demostrar o aprendido durante a realización do traballo e de ensinar ós compañeiros

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	
Tests	Description
Essay	

Assessment					
	Description	Qualification	Training and Learning Results		
Autonomous problem solving	Evaluation of the student's involvement in classes. Evaluation of the student's performance in the proposed tasks or problem resolution.	20	A2 A3 A5	C10	D11
Practices through ICT	Evaluation of the student's involvement in classes	5	A2 A3 A5	C10	D11
Presentation	(*)O alumnado terá que facer una presentación sobre un tema preparado fora de horas de clase orientado a que os seus compañeiros/as aprendan como a meteoroloxía pode afectar ás operacións aéreas ou espaciais.	10	A2		D11
Objective questions exam	Answering of short answers questions plus resolution of two or three problems	55	A2 A3 A5	C10	D11
Essay	(*)O alumnado terá que facer un traballo orientado a como a meteoroloxía pode afectar ás operacións aéreas ou espaciais.	10	A2 A3 A5		D11

Other comments on the Evaluation

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.

In the event that a student cannot apply to continuous evaluation (for justified reasons):

The oral presentation and the delivery of the exercises proposed in seminars are compulsory, in addition to taking the written test. In addition, the student will have to achieve at least half of the total grade in each of one.

In this case the qualification percentages will be:

20% exercises proposed in seminars

10% Presentation

70% Written test

Second opportunity:

100% exam.

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 degree call

The student who chooses to take the exam at the end of the degree 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,

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

Contingency plan

Description

1. MIXED MODALITY: part of the classes will be face-to-face and, if the number of students makes it necessary, another part will be through the Remote Campus

1.1. ADAPTATION OF THE METHODOLOGIES:

1.1.1.MASTER SESSION: part of the classes will be face-to-face and, if the number of students makes it necessary, another part will be through the Remote Campus

1.1.2.SEMINARS: part of the classes will be face-to-face and, if the number of students makes it necessary, another part will be through the Remote Campus

1.2. EVALUATION:

1.2.1.END OF CAREER: the test will represent 100% of the grade.

1.2.2.FIRST OPPORTUNITY: the percentage of involvement in face-to-face classes will be changed for involvement in face-to-face or virtual classes.

1.2.3.SECOND OPPORTUNITY: the test will represent 100% of the grade.

1.3. TUTORIALS: The tutorials will be in the professor's virtual office, by appointment

2. DISTANCE MODALITY: all the classes will be through the Remote Campus

2.1. ADAPTATION OF THE METHODOLOGIES:

2.1.1.MASTER SESSION: all the classes will be through the Remote Campus

2.1.2.SEMINARS: all the classes will be through the Remote Campus

2.2. EVALUATION:

2.2.1.END OF CAREER: the examination will suppose 100% of the note.

2.2.2.FIRST OPPORTUNITY: the percentage of involvement in face-to-face classes will be changed for involvement in virtual classes. The "Autonomous problem solving" will represent 10% of the grade whereas the "Objective questions exam " will represent 65% of the grade

2.2.3.SECOND OPPORTUNITY: the examination will represent 100% of the grade.

2.3. TUTORIALS: TUTORIALS: The tutorials will be in the professor's virtual office, by appointment

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	Celard Pérez, Pedro			
Lecturers				
E-mail				
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.			

Skills	
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

Learning outcomes			
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. 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 final 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 2021-22 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 edition of the minutes:

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 edition of the minutes:

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.

Evaluation criteria for 2nd edition of minutes 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

Contingency plan

Description

=== EXCEPTIONAL MEASURES PLANNED ===

Faced with the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it according to criteria of safety, health and responsibility , and guaranteeing teaching in a non-face-to-face or partially face-to-face setting. These measures already planned guarantee, when it is mandatory, the development of teaching in a more agile and efficient way, since it is known in advance (or well in advance) by the students and teachers through the standardized tool and institutionalized teaching guides.

=== ADAPTATION OF METHODOLOGIES ===

* Teaching methodologies that are maintained

- All

* Teaching methodologies that are modified

- The tutorials will become online, using Remote Campus.

- Face-to-face classes will be taught through Campus Remoto and Moovi, without prejudice to other environments and mechanisms that can be used to guarantee maximum access for students to the contents and materials of the subject.

* Non-face-to-face mechanism of attention to students (tutorials). The tutorials of students of any modality will be attended through the following mechanisms:

- Remote Campus

- Forums of the subject in Moodle

- Email

In all cases, a prior agreement mechanism may be set up to order access to tutorials.

* Modifications (if applicable) of the content to be taught

- None

* Additional bibliography to facilitate self-study

- It is not contemplated

- * Other modifications
- They are not contemplated

=== ADAPTATION OF THE EVALUATION ===

- * Tests already carried out
 - The weight is maintained in the final qualification
 - * Pending tests that remain
 - The weight is maintained in the final qualification
 - * Tests that are modified
 - Development question exams => would be done online, using Campus Rmote and Moovi.
 - * New tests
 - They are not contemplated.
 - * Additional Information
 - It is not contemplated.
-

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	Deseño na enxeñaría			
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.			

Competencias

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			
C12	Comprender os procesos de fabricación.			
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.			
C30	Coñecemento adecuado e aplicado á Enxeñaría de: As prestacións tecnolóxicas, as técnicas de optimización dos materiais utilizados no sector aeroespacial e os procesos de tratamentos para modificar as súas propiedades mecánicas.			
D11	Ter motivación pola calidade con sensibilidade cara a temas do ámbito dos estudos			

Resultados de aprendizaxe

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	C12 C19 C30	D11
O/a estudante coñece toda a información necesaria para levar a cabo un proceso de produción.	A2 A3 A5	C12 C19 C30	D11
Coñecemento, comprensión, aplicación, análise e síntese dos problemas astrodinámicos relacionados co movemento do centro de masas dun vehículo espacial; en concreto, as órbitas keplerianas, as órbitas reais condicionadas polas diferentes perturbacións orbitais, as órbitas osculatrices e os métodos numéricos usuais en Astrodinámica			
O/a estudante é capaz de realizar un informe que permita a execución exitosa dun proceso de produción.	A2 A3 A5	C12 C19 C30	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	C12 C19 C30	D11

Contidos

Topic	
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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 industrial

Bloque II

Proxectos

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	16	25	41
Prácticas con apoio das TIC	9.5	15	24.5
Aprendizaxe colaborativa	18	12	30
Aprendizaxe baseado en proxectos	1.5	37.5	39
Prácticas de laboratorio	5	8	13
Resolución de problemas e/ou exercicios	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, os estudantes poderán resolver problemas específicos que permitan mellorar o seu coñecemento sobre os procesos estudados.
Aprendizaxe colaborativa	O profesor propondrá 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.

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.

Avaliación

	Description	Qualification	Training and Learning Results
Lección maxistral	Evaluación de conceptos mediante cuestionario breve	20	A5 C12 C19 C30
Prácticas con apoio das TIC	Entrega de memorias de prácticas	20	A2 A3 A5 C12 C19 C30
Aprendizaxe colaborativa	Realización dos traballos propostos e entrega de informes, pezas.	20	A2 A3 A5 C12
Aprendizaxe baseado en proxectos	Entrega memoria de proxecto	40	A2 A3 A5 C12 C19 C30

Other comments on the Evaluation

PRIMEIRA OPORTUNIDADE:

A materia avalíase en modo de avaliación continua en base a:

- Memoria do proxecto (nota máxima 4 puntos).
- Prácticas (nota máxima 2 puntos). Entrega obrigatoria de memorias de prácticas nas datas estipuladas.
- Aprendizaxe colaborativo (nota máxima 2 puntos). Deberase 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.

Poderanse gardar traballos da primeira oportunidade con cualificación >5. A nota do exame non se gardará.

OUTRAS CONSIDERACIÓNS:

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

As actividades de laboratorio non se poderán 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>

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, Ingeniería y Tecnología**, 7, Pearson Education, 2014

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

Recomendacións

Subjects that it is recommended to have taken before

Fabricación aeroespacial/O07G410V01501

Plan de Continxencias

Description

=== MEDIDAS EXCEPCIONAIS PLANIFICADAS ===

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

=== ADAPTACIÓN DAS METODOLOXÍAS ===

* Metodoloxías docentes que se manteñen

Todas se manteñen en formato asíncrono ou síncrono a distancia. Para iso empregaranse os medios dispostos pola Universidade de Vigo: Campus Remoto e/ou MOOVI.

* Mecanismo non presencial de atención ao estudantado (titorías)

Desenvolveranse mediante email ou videoconferencia en despacho virtual.

=== ADAPTACIÓN DA AVALIACIÓN ===

* Información adicional

A avaliación mantense sen cambios en calquera circunstancia.

No escenario multimodal e/ou non presencial, cando cumpra, o persoal docente implicado na impartición da docencia resérvase o dereito de non dar o consentimento para a captación, publicación, retransmisión ou reprodución do seu discurso, imaxe, voz e explicacións de cátedra, no exercicio das súas funcións docentes, no ámbito da Universidade de Vigo.

IDENTIFYING DATA				
Mechanics of flight				
Subject	Mechanics of flight			
Code	007G410V01924			
Study programme	Grado en Ingeniería Aeroespacial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	#EnglishFriendly Spanish English			
Department				
Coordinator	Navarro Medina, Fermín			
Lecturers	Navarro Medina, Fermín			
E-mail	fermin.navarro.medina@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.			

Skills	
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	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

Learning outcomes				
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	28	0	28
Autonomous problem solving	0	80	80
Mentored work	4	17.5	21.5
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 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.	25	A2 B6 C23 D4 A3 C26 D5 A5 C31 D6 C33 D8 D11
Objective questions exam	Resolution of problems and/or conceptual questions on the contents of the subject	60	A2 B6 C23 D3 A3 C26 D4 A5 C31 D5 C33 D8 D11

Other comments on the Evaluation

First edition of record (continuous Evaluation, first opportunity)

To surpass the subject in the evaluation in the 1ª opportunity will require obtain an upper qualification to 5 points over 10 in the global assessment of the continuous evaluation during the development of the classes and the examination in the official date. The qualification of the examination in official date has to be upper to 5 points on 10. The final qualification will obtain

of agreement to the percentages indicated. The scored activities of the continuous evaluation will make during the lective hours of the subject, by what requires the regular assistance to the classes by part of the students.

The calendar of proofs of evaluation approved officially by the Board of Centre gives EEAE publishes in the web

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

The maximum length of the examination will be of 3 hours if there is not interruption or of 5 hours if there is an intermediate pause (being 3 maximum hours for each part).

Second edition of record (Second opportunity)

The student will have to present to the examination of second opportunity of all the contents of the subject, that will suppose 100% of the grade, if the final note of continuous evaluation is lower that 5 points over 10. Also it will have to present to the examination of second announcement in the following supposed:

- The no realisation or delivery of any of the scored of the continuous evaluation inside the terms established for the same.
- Obtain an inferior grade to 5 points over 10 in the final examination of continuous evaluation.

In case to obtain a greater qualification or the same to 5 in the examination of second opportunity, the final qualification of the subject will be the greater note from among:

- the examination of second opportunity
- the average with the activities made during the course (promediando with the percentages of the table of evaluation)

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

Contingency plan

Description

=== EXCEPTIONAL MEASURES SCHEDULED ===

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

=== ADAPTATION OF THE METHODOLOGIES ===

* educational Methodologies that keep

ALL, adapted to the available technological resources (remote campus, virtual blackboard, etc). The tutoring work also can carry out on-line, without more than substituting the meetings and the tutoring sessions by the the face-to-face professor by telematic.

* Educational methodologies that modify
ANY

* no face-to-face Mechanism of attention to the students (tutoring sessions)
virtual office of the remote campus

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

ANY

* additional Bibliography to facilitate the car-learning
Can use the same references

* Other modifications

=== ADAPTATION OF THE EVALUATION ===

In the case that the teaching have to give to distance from some moment of the period, distinguish two cases:

*** That all the assessed proofs already have been made in the moment of the change to teaching to distance:

- it Tests Examination of objective questions: 60%
- it Tests tutoring Work: 25%
- it Tests Resolution of problems and/or exercises: 15%

*** That there are pending proofs to make:

* Assessed Proofs remains to make in the moment of change to teaching to distance, that keep his percentages of evaluation:

- it Tests Examination of objective questions: [previous Weight 60%] [Weight Proposed 60%]
- Tests Work *tutelado: [previous Weight 25%] [Weight Proposed 25%]

* Assessed Proofs remained to make in the moment of change to teaching to distance, that modify mildly:

- it Tests Resolution of problems and/or exercises: [previous Weight 15%] [Weight Proposed 15%]. In case of impossibility to make them in the classroom, the problems will deliver in shape of bulletin to deliver, with a date established in the moment of the delivery.

* New proofs
NO new exams

* additional Information

will inform of the links and the keys to access to the virtual classroom and to the virtual office. The tutoring sessions will make in the virtual office, after previous agreement of the date and hour via mail.

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	Enxeñaría mecánica, máquinas e motores térmicos e fluídos			
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.			

Competencias	
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 de aprendizaxe			
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
			D11
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
Exame de preguntas obxectivas	1	0	1
Exame de preguntas de desenvolvemento	2	0	2
Presentación	0.5	0	0.5

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

Metodoloxía docente	
	Description
Lección 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	30	A2 A3 A5	C24 C25 C26	D3 D4 D6 D8 D11
Prácticas de laboratorio	Resolución de problemas e casos prácticos expostos nas sesións de prácticas	15	A2 A3 A5	C24 C25 C26	D3 D4 D8
Exame de preguntas obxectivas	Exame tipo test	20	A2 A3 A5	C24 C25 C26	D3 D8 D11
Exame de preguntas de desenvolvemento	Exame de problemas	30	A2 A3 A5	C24 C25 C26	D3 D4 D8
Presentación	Presentación en clase do traballo grupal desenvolvido.	5	A2 A3 A5	C24 C25 C26	D3 D4 D6

Other comments on the Evaluation

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>

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, non inferior a 4.0.

-Entregar todas as 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 4.0.

(2) Estudante que, tras unha autorización por parte do profesorado, desexen ser avaliados mediante avaliación única:

A avaliación do curso na primeira oportunidade realizarase, por defecto, mediante Avaliación Continua.

Os estudantes que teñan unha xustificación poderán renunciar oficialmente á avaliación continua e realizar un só exame final, na data oficial. A nota obtida neste exame representará o 100% da nota final. O alumno deberá superar o 5 neste exame. Este exame pode ter unha parte para realizar nunha sala de computadores e / ou laboratorio.

A renuncia á avaliación continua debe facerse durante o primeiro mes de clase. Durante este período, presentarse o xustificante ao coordinador da materia para a súa avaliación.

Segunda oportunidade e Fin de Carreira

Os alumnos que non superasen a materia na primeira oportunidade poderán realizarán un exame que supoñerá o 100% da nota. Este exame pode ter unha parte para realizar nunha sala de computadores e / ou laboratorio.

En caso de detección de copia en calquera das probas (probas curtas, exames parciais ou exame final), a cualificación final será de SUSPENSO (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

Plan de Continxencias

Description

=== MEDIDAS EXCEPCIONAIS PLANIFICADAS ===

Ante a incerta e imprevisible evolución da alerta sanitaria provocada pola COVID-19, a Universidade establece unha planificación extraordinaria que se activará no momento en que as administracións e a propia institución determinen, atendendo a criterios de seguridade, saúde e responsabilidade, e garantindo a docencia nun escenario non presencial ou non totalmente presencial.

Estas medidas xa planificadas garanten, no momento que sexa preceptivo, o desenvolvemento da docencia dunha maneira mais áxil e eficaz ao ser coñecido de antemán (ou cunha ampla antelación) polo alumnado, e o profesorado, a través da ferramenta normalizada e institucionalizada das guías docentes DOCNET.

Escenario de docencia mixta

Debido á situación excepcional, ante a imposibilidade de poder impartir a docencia dun modo totalmente presencial, utilizaranse medios virtuais tanto síncronas como asíncronas para a impartición das clases que sexan habilitadas pola Universidade de Vigo.

As prácticas serán entregadas polos estudantes e avaliadas empregando os recursos das plataforma de teledocencia dispoñible no seu momento.

As sesións de tutorización, tanto o nivel individual como o nivel de grupos poderán realizarse por medios telemáticos (correo

electrónico, videoconferencia, salgas/aulas/despachos virtuais proporcionadas pola Universidade de Vigo).

=== ADAPTACIÓN DAS METODOLOXÍAS ===

As metodoloxías docentes mantéñense principalmente cunha posible modificación temporal na planificación segundo a situación concreta.

Non procede ningunha modificacións dos contidos para impartir.

Auméntase a bibliografía co material de elaboración propia (por exemplo, guías de traballo, vídeos e textos explicativos, problemas resoltos, etc.) para facilitar a auto-aprendizaxe.

=== ADAPTACIÓN DA AVALIACIÓN ===

As probas mantéñense coas súas ponderacións previstas.

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 Galician			
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.			

Skills

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

Learning outcomes

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 A3 A5	B3 B4	C21	D3 D4 D5 D6 D8 D11 D13
- Applied knowledge of simulation, design, analysis and synthesis of experimentation and flight operations.	A2 A3 A5	B3 B4	C25	D3 D4 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
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, preferably, by appointment, 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 eliminatory exam Certification of short questions and problems (35%)*	70	A2 A3 A5	B3 B4	C21 C25	D3 D4 D5 D8 D11 D13
	Final exam Maintenance of short questions and problems (35%)					D8 D11 D13
	* In case of failing the first partial eliminatory exam, the exam must be done again on the date of the final exam.					

Other comments on the Evaluation

The evaluation of the course at the first opportunity will be carried out by Ongoing Assessment. Students who have a justification may officially waive the ongoing assessment and ask for a first opportunity final exam, on the official date. The grade obtained in this exam will represent 100% of the final grade. This exam may have a part to do in a computer room and / or laboratory. The waiver of ongoing assessment must be made during the first month of class. During this period, the justification of the resignation will be presented to the coordinator of the subject for evaluation. If this justified resignation is not done, the qualification reflected in the first call report will be "not presented".

To pass the course at the first opportunity, a score greater than 5 points out of 10 will be required in the continuous evaluation during the development of classes and the exam on the official date, together. The final grade will be obtained according to the indicated percentages.

Ongoing assessment is not passed in the following cases:

- The non-execution or delivery, without justification, of any of the items of the ongoing assessment (works reports, practicum reports, exams ...). In this case, the final grade reflected in the official record will be "not presented"
- Obtaining a grade of less than 5 points out of 10 in the final exam of ongoing assessment. In this case, the final grade reflected in the official record will be the grade of the ongoing assessment final exam.

The evaluation of the course in the second opportunity and end of studies will be carried out in a final exam on the date set by the center. The grade obtained in this exam will represent 100% of the final grade. This exam may have a part to do in a computer room and / or laboratory.

To pass the subject in the second opportunity and end of studies, a score higher than 5 points out of 10 will be required in the exam on the official date.

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.

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

The maximum length of the exams will be 3 hours if there is no interruption, and 5 hours if there is an intermediate break (maximum 3 hours for each part).

Ongoing assessment evaluation activities will be carried out during official timetable hours.

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

Recommendations

Subjects that it is recommended to have taken before

Aerospace technology/O07G410V01205

Air transport and airborne systems/O07G410V01404

Aerodynamics and aeroelasticity/O07G410V01923

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies maintained

The proposed methodologies are maintained but carried out through the Remote Campus. The platform Moovi will be used more intensively as reinforcement to ensure accessibility of the students to the contents of the subject.

* Teaching methodologies modified

Laboratory practices that require interaction with physical elements are replaced by other activities that can be carried out on the remote campus, such as work in groups.

* Contactless mechanism for student attention (tutorials)

The tutorials will place in the teacher's virtual office on the remote campus.

=== ADAPTATION OF THE EVALUATION ===

* Tests already carried out

The tests already carried out maintain their weight in the evaluation.

* Pending tests

Pending tests are planned and will be carried out using the Moodle platform and the remote campus, and they maintain their weight in the evaluation.

IDENTIFYING DATA				
Control and optimization				
Subject	Control and optimization			
Code	O07G410V01944			
Study programme	Grado en Ingeniería Aeroespacial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	García Rivera, Matías			
Lecturers	García Rivera, Matías			
E-mail	mgrivera@uvigo.es			
Web	http://moovi.uvigo.gal			
General description	The aim of this subject is to present 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.			

Skills	
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

Learning outcomes			
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
Knowledge, understanding and application of the physical sense in the movement of the fluids, of the initial conditions and of outline and of the legitimacy of the models simplified			

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

Model predictive 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	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
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.	60	A2 A3 A5	C31	D3 D4 D5 D6 D8 D11 D13

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

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**, 978-84-8322-297-3, 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

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

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

SCENARIO 1: MIXED TEACHING

Due to the exceptional situation, given the impossibility of being able to teach completely in person, virtual means will be used to teach non-contact classes.

For the non-presential part, the means provided by the University, currently the <https://campusremotouvigo.gal/> and moovi.uvigo.gal, will be used. It may also be supplemented by other means.

SCENARIO 2: NON-PRESENCE TEACHING

Due to the exceptional situation, given the impossibility of being able to teach completely in person, virtual means will be used to teach non-contact classes.

For the non-presential part, the means provided by the University, currently the <https://campusremotouvigo.gal/> and moovi.uvigo.gal, will be used. It may also be supplemented by other means.

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies maintained

All of them

* Teaching methodologies modified

None of them

* Non-attendance mechanisms for student attention (tutoring)

<https://campusremotouvigo.gal/> and moovi.uvigo.gal

* Modifications (if applicable) of the contents

No modifications

* Additional bibliography to facilitate self-learning

No additional bibliography

* Other modifications

For laboratory practices, the practices that require specific equipment will be replaced by another simulated or virtualized one. Eventually, alternative practices that do not require such equipment will be proposed. These practices may be an autonomous format in anticipation of reconciliation and / or connectivity problems.

=== ADAPTATION OF THE TESTS ===

* Tests already carried out

All tests already carried out maintain their weight

* Pending tests that are maintained

All pending tests maintain their weight

* Tests that are modified

No tests are modified

* New tests

No new test

* Additional Information

Due to the exceptional situation, due to the impossibility of being able to do the tests in person, virtual means will be used to carry out the tests.

The means provided by the University, currently <https://campusremotouvigo.gal/> and moovi.uvigo.gal/ will be used. They may also be supplemented by other means.

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 Galician			
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. ateria del programa English Friendly: Los/as estudiantes internacionales podrán solicitar al profesorado: a) materiales y referencias bibliográficas para el seguimiento de la materia en inglés, b) atender las tutorías en inglés, c) pruebas y evaluaciones en inglés.			

Skills	
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.
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

Learning outcomes	
Expected results from this subject	Training and Learning Results
- To know the propulsive needs of aircraft.	A2 B1 C29 D3 A3 C33 D4 A5 D5 D6 D8 D11 D13
Interpretation, preparation and management of technical documents, for the conceptual design, preliminary and detail of physical models and systems.	

- To know the thrusts and resistances related to the jet engines.	A2 A3 A5	B1	C29	D3 D4 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, preferably, by appointment, in the teacher's virtual office, on the Remote Campus.
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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 (20%) (Percentage can be divided into shorter tests) Final exam of short questions and problems (50%)	70	A2 A3 A5	B1	C29 C33	D3 D4 D5 D8 D11 D13
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Other comments on the Evaluation

The evaluation of the course at the first opportunity will be carried out by Ongoing Assessment. Students who have a justification may officially waive the ongoing assessment and ask for a first opportunity final exam, on the official date. The grade obtained in this exam will represent 100% of the final grade. This exam may have a part to do in a computer room and / or laboratory. The waiver of ongoing assessment must be made during the first month of class. During this period, the justification of the resignation will be presented to the coordinator of the subject for evaluation. If this justified resignation is not done, the qualification reflected in the first call report will be "not presented".

To pass the course at the first opportunity, a score greater than 5 points out of 10 will be required in the continuous evaluation during the development of classes and the exam on the official date, together. The final grade will be obtained according to the indicated percentages.

Ongoing assessment is not passed in the following cases:

- The non-execution or delivery, without justification, of any of the items of the ongoing assessment (works reports, practicum reports, exams ...). In this case, the final grade reflected in the official record will be "not presented"
- Obtaining a grade of less than 5 points out of 10 in the final exam of ongoing assessment. In this case, the final grade reflected in the official record will be the grade of the ongoing assessment final exam.

The evaluation of the course in the second opportunity and end of studies will be carried out in a final exam on the date set by the center. The grade obtained in this exam will represent 100% of the final grade. This exam may have a part to do in a computer room and / or laboratory.

To pass the subject in the second opportunity and end of studies, a score higher than 5 points out of 10 will be required in the exam on the official date.

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.

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

The maximum length of the exams will be 3 hours if there is no interruption, and 5 hours if there is an intermediate break (maximum 3 hours for each part).

Ongoing assessment evaluation activities will be carried out during official timetable hours.

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

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies maintained

The proposed methodologies are maintained but carried out through the Remote Campus. The platform faitic will be used more intensively as reinforcement to ensure accessibility of the students to the contents of the subject.

* Teaching methodologies modified

Laboratory practices that require interaction with physical elements are replaced by other activities that can be carried out on the remote campus, such as work in groups.

* Contactless mechanism for student attention (tutorials)

The tutorials will place in the teacher's virtual office on the remote campus.

=== ADAPTATION OF THE EVALUATION ===

* Tests already carried out

The tests already carried out maintain their weight in the evaluation.

* Pending tests

Pending tests are planned and will be carried out using the Moodle platform and the remote campus, and they maintain their weight in the evaluation.

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	Enxeñaría mecánica, máquinas e motores térmicos e fluídos			
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.			

Competencias

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 de aprendizaxe

Expected results from this subject	Training and Learning Results			
Coñecemento, comprensión, aplicación e análise do deseño preliminar de aeronaves.	A2	B1	C27	D3
	A3	B6	C32	D4
	A5		C33	D6
				D8
				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	26	52	78
Resolución de problemas	10	31.5	41.5
Prácticas de laboratorio	14	14	28
Exame de preguntas obxectivas	0.5	0	0.5
Exame de preguntas de desenvolvemento	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 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 dunha práctica programada relacionada cun subsistema de vehículo espacial. A realización da práctica require a preparación da mesma, a asistencia e a realización dun informe por parte do alumnado

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	Resolución de problemas e/ou preguntas conceptuais sobre os contidos da materia	35	A2 A3 A5	B1 B6	C27 C32 C33	D3 D4 D8 D11 D13
Exame de preguntas de desenvolvemento	Examen de problemas	35	A2 A3 A5	B1 B6	C27 C32 C33	D3 D4 D8 D11 D13

Other comments on the Evaluation

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>

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, non inferior a 4.0.
- Entregar todas as 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 4.0.

(2) Estudante que, tras unha autorización por parte do profesorado, desexen ser avaliados mediante avaliación única:

A avaliación do curso na primeira oportunidade realizarase, por defecto, mediante Avaliación Continua.

Os estudantes que teñan unha xustificación poderán renunciar oficialmente á avaliación continua e realizar un só exame final, na data oficial. A nota obtida neste exame representará o 100% da nota final. O alumno deberá superar o 5 neste exame. Este exame pode ter unha parte para realizar nunha sala de computadores e / ou laboratorio.

A renuncia á avaliación continua debe facerse durante o primeiro mes de clase. Durante este período, presentarase o xustificante ao coordinador da materia para a súa avaliación.

Segunda oportunidade e Fin de Carreira

Os alumnos que non superasen a materia na primeira oportunidade poderán realizarán un exame que supoñerá o 100% da nota. Este exame pode ter unha parte para realizar nunha sala de computadores e / ou laboratorio.

En caso de detección de copia en calquera das probas (probas curtas, exames parciais ou exame final), a cualificación final será de SUSPENSO (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

Plan de Continxencias

Description

=== MEDIDAS EXCEPCIONAIS PLANIFICADAS ===

Ante a incerta e imprevisible evolución da alerta sanitaria provocada pola COVID-19, a Universidade establece unha planificación extraordinaria que se activará no momento en que as administracións e a propia institución determinen, atendendo a criterios de seguridade, saúde e responsabilidade, e garantindo a docencia nun escenario non presencial ou non totalmente presencial.

Estas medidas xa planificadas garanten, no momento que sexa preceptivo, o desenvolvemento da docencia dunha maneira máis áxil e eficaz ao ser coñecido de antemán (ou cunha ampla antelación) polo alumnado, e o profesorado, a través da ferramenta normalizada e institucionalizada das guías docentes DOCNET.

Escenario de docencia mixta

Debido á situación excepcional, ante a imposibilidade de poder impartir a docencia dun modo totalmente presencial, utilizaranse medios virtuais tanto síncronas como asíncronas para a impartición das clases que sexan habilitadas pola Universidade de Vigo.

As prácticas serán entregadas polos estudantes e avaliadas empregando os recursos das plataforma de teledocencia dispoñible no seu momento.

As sesións de tutorización, tanto o nivel individual como o nivel de grupos poderán realizarse por medios telemáticos (correo electrónico, videoconferencia, salgas/aulas/despachos virtuais proporcionadas pola Universidade de Vigo).

=== ADAPTACIÓN DAS METODOLOXÍAS ===

As metodoloxías docentes mantéñense principalmente cunha posible modificación temporal na planificación segundo a situación concreta.

Non procede ningunha modificacións dos contidos para impartir.

Auméntase a bibliografía co material de elaboración propia (por exemplo, guías de traballo, vídeos e textos explicativos, problemas resoltos, etc.) para facilitar a auto-aprendizaxe.

=== ADAPTACIÓN DA AVALIACIÓN ===

As probas mantéñense coas súas ponderacións previstas.

IDENTIFYING DATA				
Prácticas en empresas				
Subject	Prácticas en empresas			
Code	007G410V01981			
Study programme	Grao en Enxeñaría Aeroespacial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4	2c
Teaching language	Castelán Galego			
Department	Enxeñaría mecánica, máquinas e motores térmicos e fluídos			
Coordinator	Martín Ortega, Elena Beatriz			
Lecturers	Martín Ortega, Elena Beatriz			
E-mail	emortega@uvigo.es			
Web	http://http://aero.uvigo.es/			
General description	Mediante a realización de prácticas en empresa o estudante poderá aplicar as competencias e coñecementos adquiridos ao longo dos seus estudos, permitindo reforzar a súa formación e facilitar a súa incorporación ao mercado laboral.			

Competencias	
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
C6	Coñecemento adecuado do concepto de empresa, marco institucional e xurídico da empresa. Organización e xestión de empresas.
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
D11	Ter motivación pola calidade con sensibilidade cara a temas do ámbito dos estudos
D12	Compromiso ético e democrático

Resultados de aprendizaxe			
Expected results from this subject	Training and Learning Results		
Coñecemento, comprensión e aplicación da organización e planificación dunha empresa ou institución do sector aeroespacial.	C6		
Coñecemento, comprensión e aplicación dos equipos de traballo, do traballo en equipo e da comunicación oral e escrita en empresas e institucións do sector aeroespacial, nacionais ou estranxeiras	A3		D2
	A4		D3
	A5		D4
			D11
			D12
Coñecemento, comprensión, aplicación, análise e síntese de distintos problemas técnicos concretos que aparecen nas empresas, aplicando con creatividade os coñecementos adquiridos na carreira	A2	C19	D12

Contidos
Topic

Coñecemento xeral por parte do estudante da organigrama e das liñas de actividade da empresa ou institución.

- Visita ás instalacións.
- Familiarización coa instrumentación, ferramentas, linguaxes de programación e paquetes de software usuais.
- Asignación do estudante a un grupo de traballo.
- Asignación ao estudante dun paquete de traballo concreto, correspondente a un dos traballos activos da empresa ou a unha das súas liñas de I+D+i, co seu correspondente cronograma.
- Realización do traballo encomendado.
- Redacción da memoria final sobre o traballo realizado xunto cos formularios oficiais requeridos

Planificación

	Class hours	Hours outside the classroom	Total hours
Prácticum, Practicas externas e clínicas	6	144	150

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

Metodoloxía docente

	Description
Prácticum, Practicas externas e clínicas	Realización das prácticas externas no organismo/empresa dentro do grupo de traballo e tarefa asignados

Atención personalizada

Avaliación

	Description	Qualification	Training and Learning Results	
Prácticum, Practicas externas e clínicas	Avaliación por parte do titor da empresa durante o desenvolvemento das prácticas (informe oficial D5)	100	A2	C6 D2
	Avaliación da memoria de prácticas entregada polo alumno ao finalizar a realización das mesmas.		A3	C19 D3
	Avaliación do informe do titor académico designado polo centro.		A4	D4
	Os estudantes en prácticas deberán manter un contacto continuado non só co seu titor na empresa, senón tamén co seu titor académico.		A5	D11
	Ao concluír as prácticas, os alumnos deberán entregar ao seu titor académico unha memoria final e o informe en documento oficial D6-			D12
	Informe do estudante.			
	Na avaliación terase en conta o seguimento realizado polo titor académico e os informes entregados polo alumno.			

Other comments on the Evaluation

Esta materia réxese polo establecido no regulamento de prácticas en empresa do centro:

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

Bibliografía. Fontes de información

Basic Bibliography

Complementary Bibliography

Recomendacións

Description

=== MEDIDAS EXCEPCIONAIS PLANIFICADAS ===

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

=== ADAPTACIÓN DAS METODOLOXÍAS ===

Adaptarase a materia seguindo en todo momento os cambios indicados desde a reitoría da Universidade de Vigo.

Mecanismo non presencial de atención ao alumnado (titorías): Realizarase o seguimento das titorías mediante ferramentas virtuais (despacho virtual en campus remoto ou ferramentas similares) e/ou email

Modificacións (si proceden) dos contidos a impartir: En caso de crise sanitaria realizaranse de forma telemática, sempre que a empresa estea de acordo. Así mesmo, en caso de crise, unha porcentaxe do número de horas poderán completarse mediante a realización de cursos on-line relacionados coa temática da materia (por exemplo cursos organizados pola área de emprego da Universidade). Estes cursos deben contar coa aprobación previa a súa realización do titor académico das prácticas en empresa para poder ser recoñecidos como parte da materia

Bibliografía adicional para facilitar o auto-aprendizaxe: Non é necesario

=== ADAPTACIÓN DA AVALIACIÓN ===

Non hai probas adicionais. En caso de realizar cursos (aprobados polo coordinador académico das prácticas en empresa) para completar o número de horas serán valorados.

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.			

Skills	
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.
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

Learning outcomes		
Expected results from this subject	Training and Learning Results	
Knowing, understanding, application, analysis and synthesis of a project in the field of specific engineering technologies for aerospace equipment and materials.	A2	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
			A3	D3
	Academic tribunal evaluation: 50%		A4	D4
	- Evaluation of the scope of the project. The scientific-technical difficulty of the work will be evaluated (25%)		A5	D5
				D6
	- Evaluation of the documentation. The quality of the TFG memory will be evaluated (25%)			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.

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies maintained

The teaching methodologies are maintained except in the experimental content works that will modify their focus and their contents to adapt to the impossibility of attending the center.

* Teaching methodologies modified

Tutored work:

- Attendance to laboratories: it will be supplemented by tutorials with the tutor and / or co-tutor.

- Tutorials with tutor and / or co-tutor: alternatively, they will be held through the Remote Campus platform of the University of Vigo.

* Non-attendance mechanisms for student attention (tutoring)

The tutoring sessions will be held, alternatively, by telematic means (email or videoconference) under the modality of prior agreement.

* Modifications (if applicable) of the contents

The works of experimental content will modify their approach and their contents to adapt to the impossibility of attending the center.

=== ADAPTATION OF THE TESTS ===

* Tests that are modified

In case of no attendance, the defenses of the works will be carried out on the Remote Campus platform.
