



IDENTIFYING DATA

Mathematics: Calculus 2

Subject	Mathematics: Calculus 2			
Code	O07G410V01201			
Study programme	(*)Grao en Enxeñaría Aeroespacial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	Galician English			
Department				
Coordinator	Area Carracedo, Iván Carlos			
Lecturers	Area Carracedo, Iván Carlos			
E-mail	area@uvigo.es			
Web	http://area.webs.uvigo.es			
General description	(*)O obxectivo da materia é que o alumnado coñeza e domine as técnicas básicas do cálculo integral, cálculo vectorial, ecuacións diferenciais ordinarias e as súas aplicacións, necesarias tanto para outras materias da titulación como para o exercicio profesional.			

Competencies

Code	
A1	(*)Que os estudantes demostrasen posuír e comprender coñecementos nunha área de estudo que parte da base da educación secundaria xeral, e adóitase atopar a un nivel que, aínda que se apoia en libros de texto avanzados, inclúe tamén algúns aspectos que implican coñecementos procedentes da vangarda do seu campo de estudo
B2	(*)Planificación, redacción, dirección e xestión de proxectos, cálculo e fabricación no ámbito da enxeñaría aeronáutica que teñan por obxecto, de acordo cos coñecementos adquiridos segundo o establecido no apartado 5 da orde CIN/308/2009, os vehículos aeroespaciais, os sistemas de propulsión aeroespacial, os materiais aeroespaciais, as infraestruturas aeroportuarias, as infraestruturas de aeronavegación e calquera sistema de xestión do espazo, do tráfico e do transporte aéreo.
C1	(*)Capacidade para a resolución dos problemas matemáticos que poidan exporse na enxeñaría. Aptitude para aplicar os coñecementos sobre: álgebra lineal; xeometría; xeometría diferencial; cálculo diferencial e integral; ecuacións diferenciais e en derivadas parciais; métodos numéricos; *algorítmica numérica; estatística e optimización.
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.
D1	(*)Capacidade de análise, organización e planificación
D3	(*)Capacidade de comunicación oral e escrita na lingua nativa
D4	(*)Capacidade de aprendizaxe autónoma e xestión da información
D5	(*)Capacidade de resolución de problemas e toma de decisións
D6	(*)Capacidade de comunicación interpersoal
D8	(*)Capacidade de razoamento crítico e autocrítico

Learning outcomes

Expected results from this subject	Training and Learning Results			
Knowledge and understanding of models using ordinary differential equations and the main techniques of integration	A1	B2	C1 C32	D1 D3 D4 D5 D6 D8

Knowledge, understanding and application of the numerical methods for solving the models and classical problems of Aerospace Technology namely, polynomial interpolation, numerical differentiation, numerical integration, and solution of ordinary differential equations	A1	B2	C1 C8 C32	D1 D3 D4 D5 D6 D8
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Contents

Topic	
Integration of functions of several variables	Multiple integrals. Fubini's theorem. Change of variable. Line and surface integrals. Gauss and Stokes' theorems. Numerical integration.
Ordinary differential equations	Introduction to ordinary differential equations. Solutions. Existence and uniqueness. Analytic methods for solving ODEs. Linear systems and linear systems with constant coefficients. Numerical solution of ODEs.

Planning

	Class hours	Hours outside the classroom	Total hours
Master Session	18	36	54
Laboratory practises	12	24	36
Troubleshooting and / or exercises	14	26.6	40.6
Autonomous troubleshooting and / or exercises	5	9.5	14.5
Introductory activities	1	1.4	2.4
Long answer tests and development	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
Master Session	The professor will present in the theoretical classes the contents of the subject. Students will have basic reference texts for tracking the subject.
Laboratory practises	The professor will solve problems and exercises with computer tools and the student will have to solve similar exercises to acquire the necessary skills.
Troubleshooting and / or exercises	The professor will solve problems and exercises manually and the student will have to solve similar exercises to acquire the necessary skills.
Autonomous troubleshooting and / or exercises	The students will have to solve exercises independently to check the acquisition of the skills.
Introductory activities	Activities to make contact and gather information on the students, and to present the subject.

Personalized attention

Methodologies	Description
Master Session	The professor will personally solve the doubts of students. The doubts will be solved in-person, specially during problems and laboratory lectures and during tutorials, and also by using the remote options available for the course.
Laboratory practises	The professor will personally solve the doubts of students. The doubts will be solved in-person, specially during problems and laboratory lectures and during tutorials, and also by using the remote options available for the course.
Troubleshooting and / or exercises	The professor will personally solve the doubts of students. The doubts will be solved in-person, specially during problems and laboratory lectures and during tutorials, and also by using the remote options available for the course.

Assessment

	Description	Qualification	Training and Learning Results			
Autonomous troubleshooting and / or exercises	Written tests and / or work to assess will be made to evaluate solving exercises and / or problems autonomously.	40	A1	B2	C1 C32	D1 D3 D4 D5 D6 D8

Long answer tests and development	A final exam on the contents of all the course will be made.	60	A1	B2	C1 C32	D1 D3 D4 D5 D8
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Other comments on the Evaluation

It is required to obtain at least 30% of the maximum of the mark of each of the blocks of the subject to pass the exam. The final exam will last at most 3 hours.

The evaluation system June-July is the same as in May-June, keeping the corresponding qualifications obtained via troubleshooting and / or exercises and attendance and participation.

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

Ethical commitment:

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

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

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

Sources of information

Basic Bibliography

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

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

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

Complementary Bibliography

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

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

A. García et al., **Ecuaciones Diferenciales Ordinarias**, CLAGSA, 2006

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

P. Pagola Martínez, J. L. López García, **Cálculo en varias variables y ecuaciones diferenciales**, 2ª, Universidad Pública de Navarra, 2017

Recommendations

Subjects that are recommended to be taken simultaneously

Physics: Physics 2/O07G410V01202

Aerospace technology/O07G410V01205

Subjects that it is recommended to have taken before

Physics: Physics 1/O07G410V01103

Computer science/O07G410V01104

Mathematics: Linear algebra/O07G410V01102

Mathematics: Calculus 1/O07G410V01101