UNIVERSIDADE DA CORUÑA

Teaching Guide				
Identifying Data				2023/24
Subject (*)	Calculus		Code	614G01003
Study programme	Grao en Enxeñaría Informática			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	1st four-month period	First	Basic training	6
Language	SpanishGalicianEnglish			
Teaching method	Face-to-face			
Prerequisites				
Department	Matemáticas			
Coordinador	Hervella Nieto, Luis Maria	E-mail	luis.hervella@udc.es	
Lecturers	Arregui Alvarez, Iñigo Cendan Verdes, Jose Jesus García Rodríguez, José Antonio Hervella Nieto, Luis Maria López Salas, José Germán Prieto Aneiros, Andrés	E-mail	inigo.arregui@udc.es jesus.cendan.verdes@udc.es jose.garcia.rodriguez@udc.es luis.hervella@udc.es jose.lsalas@udc.es andres.prieto@udc.es	
Web	campusvirtual.udc.gal/			
General description	In this subject we explain concepts of the analysis of real functions of a real variable (continuity, derivative, integration, ...), with applications in real problems of optimisation and approximation of functions.			

Study programme competences / results	
Code	Study programme competences / results
A1	Capacidade para a resolución dos problemas matemáticos que se poden presentar na enxeñaría. Aptitude para aplicar os coñecementos sobre: álxebra linear; cálculo diferencial e integral; métodos numéricos; algorítmica numérica; estatística e optimización.
B3	Capacidade de análise e síntese

Learning outcomes			
Learning outcomes	Study programme competences / results		
Being able to analyze functions of a real variable: - Limits , continuity, differentiation, optimization and graphical representation - Definite and indefinite integration and its application to the calculation of areas and volumes , as well as solving differential equations.	A1	B3	
Being able to use a computer application of symbolic and computational calculus for the development of the contents of the subject	A1	B3	

Contents	
Topic	Sub-topic
Sets of numbers	Classic sets of numbers Complex numbers
Real valued functions of one real variable	Basic definitions Elementary functions Limits Continuity Bisection method Lagrange interpolation polynomial

Derivation	Definition of derivative and basic properties Newton-Raphson method Higher order derivatives Applications of derivatives Convexity and concavity Taylor's theorem
Integration	Indefinite integration Riemann integration Fundamental Theorem of Calculus Numerical integration Improper integration Applications of integration Differential equations
Pyhton for one variable calculus	SymPy introduction Limits and continuity in Sympy NumPy introduction Graphics with Matplotlib Derivation in Python Integration in Python

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Laboratory practice	A1 B3	18	18	36
Guest lecture / keynote speech	A1 B3	30	60	90
Seminar	A1 B3	9	9	18
Objective test	A1 B3	0	3	3
Personalized attention		3	0	3
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Laboratory practice	- The use of the software package Octave, which will be used in the subject for symbolic and numerical computation, will be taught . - Problems related to the subject will be solved using Octave
Guest lecture / keynote speech	- Presentations in (previously provided to students) containing the basic notes to follow the development of the subject, will be maid using a projector - Short videos will be used to illustrate some key points in the development of the subject, both in the theoretical and practical parts.
Seminar	- Doubts of the students will be resolved, as well as works and exercises from the problem sets, previously available, or others proposed by the teacher or the students. For this, when necessary, the software explained in the laboratory practices will be used. - In some seminars the possibility of carrying out, on a voluntary basis, a project linked to the Sustainable Development Goals (SDGs) will be offered. In this educational task, the student will link the contents of the Calculus subject with some of the SDGs, proposing and solving mathematical problems related to them.
Objective test	- A quiz consisting of a collection of theoretical and/or practical questions will be done

Personalized attention	
Methodologies	Description

Seminar Laboratory practice	- The diversity of the students and their background recomends giving an orientation, that should be carried out in the framework of a personalized tutorial action. - In the laboratory sessions the teacher, who will be present in the clasroom, will guide and help students to develop the practises, teaching them in the use of a software package, helping them to understand some theoretical and practical aspects of the subject. - During the seminars (TGR) the teacher will help the students in the resolution of theoretical and applied exercises. - Tutorials will be held through the Teams platform to students who request it.

Assessment			
Methodologies	Competencies / Results	Description	Qualification
Seminar	A1 B3	Throughout the course there will be two test-type tests with a maximum grade, each one, of 10% of the grade. Those students who do not reach the maximum grade in these written tests will be able to recover the remaining part by taking the mixed test. Eventually and with prior agreement with the teacher, the student will be able to obtain this 20% of the grade by completing a project linked to the Sustainable Development Goals (SDGs).	60
Guest lecture / keynote speech	A1 B3	There will be no evaluation practices during these sessions.	0
Laboratory practice	A1 B3	Up to 4 assessment tests will be carried out during the laboratory classes that will account for 40% of the final grade. Only students enrolled part-time who have not been evaluated in the laboratory practical part will be able to take a specific test to recover 40% of the mark corresponding to this part.	0
Objective test	A1 B3	The final exam, with a value between 40 and 100% (depending on the grade obtained in the seminar part) will consist of taking a written test.	40

Assessment comments
The students will finish the class period with a maximum of 60% of the grade, which will be obtained through four quizzes that will be conducted during seminar sessions (each quiz carrying a weight of 15%). In each of these quizzes, each student will solve one or several practical problems using their laptop and Python software, as explained in the laboratory practices. Note: If any illicit activity is detected in any of these quizzes (such as copied exercises, inappropriate use of online resources, etc.), all students involved will receive a grade of 0 for the respective quiz, and, depending on the severity of the incident, the teachers may decide to assign a global grade of 0 for the entire "Seminar" section. On dates determined by the Faculty Board, students will take a written final exam for the course. The grade obtained in the final exam will be scaled so that each student has the opportunity to recover the portion lost in the evaluation corresponding to the seminars. Thus, the final exam will account for 40% to 100% of the final grade for the course. It is necessary to obtain a grade equal to or higher than 2.50 out of 10 in the final exam to pass the course. The final exam for the second opportunity (June or July 2023) will follow the same principles as the first opportunity. The evaluation of the seminars and laboratory practices for part-time students will be conducted taking into account their specific circumstances, as far as possible. Regarding the extraordinary December session, the evaluation process will include: a) An objective test worth a maximum of four points. b) An exam to assess the knowledge acquired in the laboratory practices, worth a maximum of six points.

Sources of information

Basic	Bibliografía básica:Teachers of this subject. Cálculo en una variable. Jupyter Book. https://gei-cal.github.io/JB-Calculo1-UDCG. Strang, E. Herman. Cálculo (Volume 1). Openstax: http://openstax.org/books/cálculo-volumen-1/G. Strang, E. Herman. Cálculo (Volume 2). Openstax: https://openstax.org/books/cálculo-volumen-2/R. Larson, B.H. Edwards, Cálculo 1, 10ª edición. Ed. McGraw-Hill, 2016.R.T. Smith, R.B. Minton. Cálculo 1, 2ª edición. Ed. McGraw-Hill, 2003. Q. Kong, T. Siauw, A. Bayen. Pyhton Programming and Numerical Methods. Jupyter Book de Berkeley, 2020 (https://pythonnumericalmethods.berkeley.edu/notebooks/Index.html).R. Johansson. Numerical Python. Ed. Apress, 2019 (pdf on line).J. Kiusalaas. Numerical methods in engineering with Python, 3ª edición. Ed. Cambridge, 2013.
Complementary	Complementary bibliography:Blog "existelimite" de Luis Hervella, Universidade da Coruña: https://existelimite.blogspot.com/Curso "Cálculo I". Domingo Pestana, José Manuel Rodríguez, Universidad Carlos III: https://ocw.uc3m.es/course/view.php?id=239Curso "Cálculo de funciones de 1 variable" de Miguel Martín Suárez, Universidad de Granada: https://www.ugr.es/~mmartins/material.htm

Recommendations
Subjects that it is recommended to have taken before
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Numerical Methods for Computing/614G01064
Other comments
Daily work is recommended for getting optimal profit from the seminars (TGR) and laboratory practices. Also assistance to the master classes is recommended.

(*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.