UNIVERSIDADE DA CORUÑA

Teaching Guide				
Identifying Data				2017/18
Subject (*)	Mathematics 1		Code	730G05001
Study programme	Grao en Enxeñaría Naval e Oceánica			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	1st four-month period	First	FB	6
Language	SpanishGalician			
Teaching method	Face-to-face			
Prerequisites				
Department	Matemáticas			
Coordinador	Brozos Vázquez, Miguel	E-mail	miguel.brozos.vazquez@udc.es	
Lecturers	Brozos Vázquez, Miguel Torres Miño, Araceli	E-mail	miguel.brozos.vazquez@udc.es araceli.torres@udc.es	
Web	campusvirtual.udc.es/moodle			
General description	This introductory calculus course covers differentiation and integration of functions of one and several variables. Topics include: the study of functions of one and several variables, their continuity and differenciability; Taylor polynomials and its application in optimization, finding local extrema and constrained optimization; the integration of functions in one variable, both by using Riemann sums and numerical integration and also using Barrow's rule, together with its applications to computing arc lengths, volumes of revolution and surface areas of revolution; and finally the integration of functions of several variables, together with its application to computing volume and mass of a solid body and its center of mass.			

Study programme competences	
Code	Study programme competences
A1	Skill for the resolution of the mathematical problems that can be formulated in the engineering. Aptitude for applying the knowledge on: linear algebra; geometry; differential geometry; differential and integral calculation; differential equations and in partial derivatives; numerical methods; algorithmic numerical; statistics and optimization
A5	Have a capacity for the space vision and knowledge of the techniques of graphic representation, so much for traditional methods of metric geometry and descriptive geometry, as through the applications of design assisted by computer
B1	That the students proved to have and to understand knowledge in an area of study what part of the base of the secondary education, and itself tends to find to a level that, although it leans in advanced text books, it includes also some aspects that knowledge implicates proceeding from the vanguard of its field of study
B2	That the students know how to apply its knowledge to its work or vocation in a professional way and possess the competences that tend to prove itself by the elaboration and defense of arguments and the resolution of problems in its area of study
B3	That the students have the ability to bring together and to interpret relevant data (normally in its area of study) to emit judgments that include a reflection on relevant subjects of social, scientific or ethical kind
B5	That the students developed those skills of learning necessary to start subsequent studies with a high degree of autonomy
B6	Be able to carrying out a critical analysis, evaluation and synthesis of new and complex ideas.
C1	Using the basic tools of the technologies of the information and the communications (TIC) necessary for the exercise of its profession and for the learning throughout its life.
C4	Recognizing critically the knowledge, the technology and the available information to solve the problems that they must face.
C5	Assuming the importance of the learning as professional and as citizen throughout the life.

Learning outcomes	
Learning outcomes	Study programme competences

To think in a logic, critic and creative way.		B1 B2 B3 B5 B6	C4 C5
Get familiar with calculus language	A1	B1 B5	
To understand the main characteristics of the formulation of a mathematical problem using the tools of the inifinitesimal calculus.	A1 A5	B2 B3 B5 B6	C4
To be able to use the bibliography and the available IT tools to find the necessary information for solving a given problem	A1 A5	B5 B6	C1 C4 C5
To be able to evaluate the difficuylty of a problem and to choose the most suitable technique among the studied ones to carry on its solution. Have a good predisposition for problem solving		B3	C1 C4 C5
To know the underlying geometrical meaning of the studied mathematical formalism. To be able to represent sets in the plane and in the three dimensional space using different coordinates systems	A1 A5	B1 B2	
To obtain a basic knowledge of functions of several variables: level sets, limits, continuity	A1 A5	B1 B2 B3	
Ability of thinking in an abstract way, understanding and simplifying complex problems.	A1	B1 B2 B3 B5 B6	C4
To understand the importance of partial derivatives and their relation to instantaneous variation of a magnitude (phisical, chemical, economical) and to asses their utility for the correct mathematical formulation of problems in engineering	A1	B2 B5 B6	
To understand the meaning of integrals and their usage for the formulation of several problems in engineering. To know how to apply integral for the computation of areas of plane figures, areas of a surface of revolution and solid volumes.	A1	B2 B5 B6	

Contents	
Topic	**Sub-topic**
Complex numbers	The field of complex numbers. Operations: sum, produt. Module and argument. Polar form. Operating in polar form.
The space R^n	The vector space R^n. Scalar product: norms and distances. Classification of points and sets. Topology of R^n: bounded set, extrema. Coordinates systems: polar, cylindrical and spherical coordinates.
Functions of several variables	Scalar and vector functions. Level sets. Continuity. Continuity in compact sets.

Differenciation of funcions of several variables	Directional derivative. Partial derivatives: properties and practical computing. Differential map of a function. Gradient, relation with partial derivatives. Relation between the differential map and partial derivatives: jacobian matrix. Higher order partial derivatives. Introduction to vector calculus.
Applications of the differenciation of functions of several variables	Taylor polynomial for funcions of one and several variables. Critical points. Classification: Hessian matrix. Constrained optimization: dimensionality reduction, Lagrange multipliers method. Implicit function and inverse function theorems.
Integration of funcions of one variable	Riemann sums. Integrable functions. Integral Calculus Theorems: Mean Value Theorem, Fundamental Theorem and Barrow's rule. Primitive Calculus. Polinomial interpolation. Numerical integration. Compound Simpson's Rule. Application of integral calculus to computing arc lengths, volumes of revolution and surface areas of revolution.
Integration of functions of several variables	Double integrals. Triple integrals. Change of variable in double and triple integrals. Application of integral calculus to computing volume and mass of a solid body and its center of mass.
Appendix: The free software program, MAXIMA	Practical sessions with the free software program MAXIMA

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A1 A5 B3 B5 B6 C4 C5	30	45	75
Problem solving	A1 A5 B1 B2 B3 B5 B6 C4 C5	20	25	45
Objective test	A1 A5 B1 B2 B3 B5 B6 C1 C4 C5	6	0	6
ICT practicals	A1 B1 B2 B3 C1 C4	10	10	20
Personalized attention		4	0	4
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Guest lecture / keynote speech	The course will be developed during the regular classes where the professor will explain the main concepts and results of the subject.
Problem solving	This classes are organiized in such a way that we practice how to solve the proposed problems.
Objective test	Three exams will be carried out during the course. The first one will be a partial exam where only some of the chapters will be considered. A final exam will be done at the end of the semester. Furthermore a computer exam will be carried out.

ICT practicals	Problems are solved assisted by the computer programm Maxima.

Personalized attention	
Methodologies	**Description**
ICT practicals Problem solving	The contents of the subject as well as the different methodologies developed require that students work by themselves. This will generate some questions that they can ask during the classes or during the office hours. Also, the ICT practicals will be guided by the professors in charge.

Assessment			
Methodologies	**Competencies**	**Description**	**Qualification**
Objective test	A1 A5 B1 B2 B3 B5 B6 C1 C4 C5	Written exams to assess the knowledge of the subject by the students. The subject will consist on three parts and the final qualification of the subject will be the addition of the qualification obtained at each of these parts. 1) The first one will be performed during the teaching period and will involve all the chapters studied until the celebration of the exam. If the student passes this exam, the qualification is retained until the end of the present course. This part will be recoverable in the final exam (second chance), to be held in July. 2) The second (and final) exam will be carried out in the period of final exams. It will involve the second part of the subject and a second chance to pass the first part. The weight of both exams will be 90% of the final qualification. In case of passing any of these two parts, either in the partial exam or in the final exam of January, the qualification is retained for the present course until the exam of second opportunity. 3) The third part will consist on the evaluation the competences using the program MAXIMA, where students must show their capacity for problem solving using the MAXIMA program. The weight of this third part will be the 10% of the final qualification. This part WILL NOT be recoverable, but the obtainned qualification will be retained until the second opportunity.	100

Assessment comments

Sources of information

Basic	- Salas, L., Hille, E., Etgen, G. (2003). Calculus. vol I-II. Madrid. Reverté - García, A. et al. (2007). Cálculo II. Teoría y Problemas de Análisis Matemático en Varias Variables. Madrid. Clagsa - García Castro, F., Gutiérrez Gómez, A. (1990-1992). Cálculo Infinitesimal. I-1,2. Pirámide. Madrid - Marsden, J., Tromba, A. (2010). Cálculo vectorial. ADDISON WESLEY - Spiegel, M. R. (1991). Cálculo Superior. Madrid. McGraw-Hill - Varios (1990). Problemas de Cálculo Infinitesimal. Madrid. R.A.E.C. - De Diego, B. (1991). Ejercicios de Análisis: Cálculo diferencial e intergral (primer curso de escuelas técnicas superiores y facultades de ciencias). Madrid. Deimos - Tébar Flores, E. (1977). Cálculo Infinitesimal. I-II. Madrid. Tébar Flores - García, A. et al. (2007). Cálculo I. Teoría y Problemas de Análisis Matemático en Una Variable. Madrid. Clagsa - Larson, R., Hostetler, R., Edwards, B. (2013). Calculus. . Brooks Cole - Coquillat, F (1997). Cálculo Integral. Madrid. Tebar Flores - Soler, M., Bronte, R., Marchante, L. (1992). Cálculo infinitesimal e integral. Madrid - Burgos Román, Juan de (2007). Cálculo infinitesimal de una variable. Madrid. McGraw-Hill
Complementary	As seguintes páxinas web poden resultar de interese para o estudio da materia: www.intmath.com www.ies.co.jp/math/java/ http://demonstrations.wolfram.com/http://dm.udc.es/elearning/ www.intmath.com www.ies.co.jp/math/java/ http://193.146.36.49/mat1

Recommendations
Subjects that it is recommended to have taken before
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Linear Algebra/730G03006 Statistics/730G03008 Diferential Equations/730G03011 Reliability Statistics and Numerical Methods/730G03046
Other comments

(*)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.