



## Teaching Guide

Identifying Data					2015/16
Subject (*)	Matemáticas 2	Code	610G01002		
Study programme	Grao en Química				
Descriptors					
Cycle	Period	Year	Type	Credits	
Graduate	2nd four-month period	First	FB	6	
Language	Spanish				
Teaching method	Face-to-face				
Prerequisites					
Department	Matemáticas				
Coordinador	Otero Vereá, Jose Luis	E-mail	luis.verea@udc.es		
Lecturers	Jacome Pumar, Maria Amalia Otero Vereá, Jose Luis	E-mail	maria.amalia.jacome@udc.es luis.verea@udc.es		
Web					
General description	Esta asignatura pretende o desenvolvemento de competencias que permitan ó alumnado desenvolver un coñecemento crítico do calculo diferencial e integral de varias variables, ampliar os coñecementos en ecuacións diferenciais, así como una pequena introducción á estatística.				

## Study programme competences / results

Code	Study programme competences / results
A15	Ability to recognise and analyse new problems and develop solution strategies
A16	Ability to source, assess and apply technical bibliographical information and data relating to chemistry
A20	Ability to interpret data resulting from laboratory observation and measurement
A24	Ability to explain chemical processes and phenomena clearly and simply
A25	Ability to recognise and analyse link between chemistry and other disciplines, and presence of chemical processes in everyday life
A27	Ability to teach chemistry and related subjects at different academic levels
B1	Learning to learn
B2	Effective problem solving
B3	Application of logical, critical, creative thinking
B6	Ethical, responsible, civic-minded professionalism
C1	Ability to express oneself accurately in the official languages of Galicia (oral and in written)
C3	Ability to use basic information and communications technology (ICT) tools for professional purposes and learning throughout life
C6	Ability to assess critically the knowledge, technology and information available for problem solving

## Learning outcomes

Learning outcomes	Study programme competences / results		
The study, representation and interpretation of elementary functions of univariate and multivariate functions.	A15	B1	C1
	A16	B2	C3
	A20	B3	C6
	A24	B6	
	A25		
	A27		



Use skilfully the techniques of calculation of primitive and its applications.	A15 A16 A20 A24 A25 A27	B1 B2 B3 B6	C1 C3 C6
Set out and solve simple models that comport equations and systems of differential equations.	A15 A16 A20 A24 A25 A27	B1 B2 B3 B6	C1 C3 C6
Solve problems of basic statistical methods from the descriptive point of view	A15 A16 A20 A24 A25 A27	B1 B2 B3 B6	C1 C3 C6

Contents	
Topic	Sub-topic
? Functions of Several Variables.	<ul style="list-style-type: none"> <li>o Graphs an Level Curves.</li> <li>o Polar Coordinates. Cylindrical and Spherical Coordinates.</li> <li>o Partial Derivatives. Differentiability and Gradient.</li> <li>o Directional Derivatives. Repeated Partial Derivatives.</li> <li>o The Chain Rule. The Jacobian Matrix. The Hessian.</li> <li>o Critical Points. Maxima and Minima.</li> <li>o Constrained Optimisation. Lagrange Multipliers.</li> <li>o Least Squares Analysis.</li> </ul>
? Multiple Integrals.	<ul style="list-style-type: none"> <li>o Repeated Integrals. Double Integrals. Triple Integrals.</li> <li>o Change of Variable in Multiple Integrals.</li> <li>o Curve Integrals.</li> <li>o Potential Function.</li> <li>o Green's Theorem.</li> <li>o Surface Integrals.</li> <li>o Stokes' Theorem.</li> </ul>
? Ordinary Differential Equations.	<ul style="list-style-type: none"> <li>o First Order Differential Equations.</li> <li>o Separable First Order Differential Equations.</li> <li>o Homogeneous equations.</li> <li>o Exact First Order Differential Equations.</li> <li>o Linear First Order Differential Equations.</li> <li>o Bernoulli Equations.</li> <li>o Applications of First Order Differential Equations.</li> <li>o Linear Differential Equations with Constant Coefficients.</li> <li>o The Method of Undetermined Coefficients.</li> <li>o Variation of Parameters.</li> <li>o Linear Systems with Constant Coefficients.</li> </ul>
Descriptive Statistics	<ul style="list-style-type: none"> <li>Univariate Descriptive Statistics</li> <li>Bivariate Descriptive Statistics</li> <li>Simple Linear Regression Analysis</li> </ul>



Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A15 A16 A24 A27 B1 B2 B3 B6	32	64	96
Problem solving	A20 A25 B2 B3 C1	8	18	26
Supervised projects	A15 A20 B3 B1 C1 C3 C6	8	16	24
Multiple-choice questions	B2 B3	3	0	3
Personalized attention		1	0	1

(\*)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	Explanation of the contents and solution of problem from previous academic years.
Problem solving	Question lists and exams from other courses that will be regularly available about different contents and requested to be solved by the students.
Supervised projects	Supervised projects proposed by the teacher. They must include a theoretical abstract along with a list of solved problems on the corresponding issue.
Multiple-choice questions	Exam guided to assess the knowledge of the theoretical contents explained in the keynote speeches.

Personalized attention	
Methodologies	Description
Supervised projects Guest lecture / keynote speech Problem solving	Personalized attention is designed as work of the student face to face with the teacher, so the student involvement is assumed. The way and moment of these meetings will be designated during the course according to the subject work plan.

Assessment			
Methodologies	Competencies / Results	Description	Qualification
Supervised projects	A15 A20 B3 B1 C1 C3 C6	Development of specific aspects with examples and solved problems. Competences A24, A27, B3 and C1 will be assessed.	10
Multiple-choice questions	B2 B3	Test with 20 questions about Mathematics and 10 about Statistics, with 4 options, and for each 3 failed answers one correct answer will be eliminated. Competencie C6 will be assessed.	70
Guest lecture / keynote speech	A15 A16 A24 A27 B1 B2 B3 B6	Questions to the students.	10
Problem solving	A20 A25 B2 B3 C1	Delivery of exercises and solved exams from previous courses. Competences A15, A16, A20, A25, B1, B2, B6 and C3 will be assessed.	10
Others			

Assessment comments



To pass the subject it is compulsory to obtain a final mark, after adding all the activities marks, at least 50% of the total qualification.  
 To get a NO SHOW mark, the student will not be able to attend the supervised projects nor the final multiple-choice questions exam.  
 The guideline to pass the subject in July is the previous one, or to get a mark in the final multiple-choice exam not lower than 50%.  
 Regarding following academic years, the teaching guides management, including the assessment, refers only to the ongoing academic year.  
 Therefore, all the activities and assessment methodologies scheduled and planned for the following year will start from zero.  
 Supervised projects and problem solving of part-time students will be assessed in a personalized way.

### Sources of information

<b>Basic</b>	<p>¿Cálculo ?. Larson . Mcgraw-Hill¿Cálculo varias variables ?. Jon Rogawski. Editotial Reverté ¿Ecuaciones diferenciales con aplicaciones de modelado?. Zill. Thomson-Learning. CAO ABAD, R. y otros (2001). Introducción a la estadística y sus aplicaciones. Ed. Pirámide. MILLER, J.C. Y MILLER, J.N. (2002). Estadística para Química Analítica. Addison-Wesley Iberoamericana.TOMEO PERUCHA V. y UÑA JUÁREZ I. (2003). Lecciones de Estadística Descriptiva. Paraninfo.</p>
<b>Complementary</b>	<p>- ( ) . .        ¿Cálculo I?. Alfonso García. CLGSA ¿Cálculo II?. Alfonso García. CLGSA ¿Problemas de funciones de varias variables ?. Alegre. PPU ¿Ecuaciones diferenciales?. Rainville. Prentice Hall. ¿Ecuaciones diferenciales?. Ayres. Mcgraw-Hill ¿Cálculo ?. Bradley. Prentice Hall ¿Cálculo ?. Finney. Addison-Wesley ¿Cálculus ?. Salas / Hille / Etgen. Reverté GARCÍA ÁLVAREZ-COQUE, C. Y RAMIS RAMOS, G. (2001). Quimiometría. Editorial SíntesisGONICK, L. Y SMITH, W. (2001). A estatística ¡en caricaturas! SGAPEIO</p>

### Recommendations

#### Subjects that it is recommended to have taken before

Matemáticas 1/610G01001

#### Subjects that are recommended to be taken simultaneously

#### Subjects that continue the syllabus

#### Other comments

It would be advisable to have knowledge of Matemáticas 1. As far as the block of Statistics is concerned, it is highly recommended the active involvement in the practicals and seminars.

(\*)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.