 UNIVERSIDADE DA CORUÑA

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| **Teaching Guide** | | | | |
| **Identifying Data** | | | **2019/20** | |
| **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 | | | |
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| **Web** | moodle.udc.es/ | | | |
| **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. | | | |

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| **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 |

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| **Learning outcomes** | | | |
| **Learning outcomes** | **Study programme competences / results** | | |
| Being able to analyze functions of a real variable:<br>- Limits , continuity, differentiation, optimization and graphical representation<br>- 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 | |

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| **Contents** | |
| **Topic** | **Sub-topic** |

| Real valued functions of one real variable | - Important sets of numbers |
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| | - Real valued functions of one real variable |
| | - Elementary functions |
| | - Limit of a function at one point |
| | - Continuity |
| | - Bisection method |
| | - Lagrange interpolation |
| Differential calculus of real valued functions of one real variable | - Differentiability |
| | - Derivative of elementary functions |
| | - Newton-Raphson's Method |
| | - Relative and absolute extrema |
| | - Theorems of differential calculus |
| | - Immediate applications of derivatives |
| | - Higher order derivatives |
| | - Taylor's theorem |
| | - Implicit and logarithmic differentiation |
| Integral calculus of real valued functions of one variable | - The Riemann integral |
| | - Elementary methods for the calculus of primitives |
| | - Improper integrals |
| | - Applications of the integral |
| | - Numerical integration |
| | - Introduction to differential equations |

| Planning | | | | |
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| Methodologies / tests | Competencies / Results | Teaching hours (in-person & virtual) | Student?s personal work hours | Total hours |
| Guest lecture / keynote speech | A1 B3 | 30 | 60 | 90 |
| Laboratory practice | A1 B3 | 18 | 18 | 36 |
| 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 |
| Guest lecture / keynote speech | - Presentations in .pdf format (previously provided to students) containing the basic notes to follow the development of the subject, will be maid using a projector<br>- Theory will be presented using the blackboard and providing clarifying examples<br>- Applets created explicitly for the subject and others available on the Internet will be used to illustrate some aspects of the subject. |
| Laboratory practice | - The use of the software package Octave, which will be used in the subject for symbolic and numerical computation, will be taught .<br>- Problems related to the subject will be solved using Octave |
| Seminar | - In small groups tutories (TGR), which are called 'Seminars' in this guide, doubts of students will be solved, as well as exercises of the problems sets -available on beforehand- or other problems proposed by the teacher or the students.<br><br>- In some seminars students can do, voluntarily, a project related with the Sustainable Development Goals (SDG). In this educational task, the student will associate the contents of this subject with some of the SGD. |
| Objective test | - A quiz consisting of a collection of theoretical and/or practical questions will be done |

| Personalized attention | |
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| **Methodologies** | **Description** |
| Laboratory practice Seminar | - 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.<br>- 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.<br>- During the seminars (TGR) the teacher will help the students in the resolution of theoretical and applied exercises.<br><br>Without forgetting that, as already mentioned, that doubts can also be solved in a more personal way in the tutorial hours of the teacher. |

| Assessment | | | |
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| **Methodologies** | **Competencies / Results** | **Description** | **Qualification** |
| Laboratory practice | A1 B3 | Students will do 2 exams during laboratory classes that will represent 30% of the final qualification.<br>Only part-time students that have not been evaluated of laboratory practice can do a specific exam to recover the 30% of the mark corresponding to this part. | 30 |
| Seminar | A1 B3 | During the course, students will do a written exam with a maximum qualification of 10% of the final mark. Those students who do not obtain the maximum qualification in this written exam, can recover the missing part when they do the final exam.<br><br>Eventually according to the teacher, the student can obtain this 10% of the qualification doing a project related with the Sustainable Development Goals (SDG). | 10 |
| Objective test | A1 B3 | The final exam, with a value between 50 and 70% (depending on the qualification obtained in the Guest lecture exam and the Seminar exam) will consist of a written exam of test type. | 50 |
| Guest lecture / keynote speech | A1 B3 | During the course, students will do a written exam with a maximum qualification of 10% of the final mark. Those students who do not obtain the maximum qualification in this written exam, can recover the missing part when they do the final exam. | 10 |

| Assessment comments |
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| The student will finish the classes period with a maximum of 50% of the qualification, that will be obtained through two written exams (10% each one) and two exams corresponding to the laboratory practice (30%).<br>In the dates stablished by the Faculty Board, the student will do a written exam. The grade obtained in the final exam will be rescheduled so that the student has the opportunity to recover the lost part of the 20% of the grade corresponding to the written examinations made during the guest lectures and the seminars. It is not possible to recover the mark corresponding to the evaluation of the laboratory practices. In this way, the final mark of the final exam will be between 5 and 7 points out of 10.<br>The evaluation of the  guest lectures, seminars and laboratory practices of students with part-time enrollment can be made taking into account, as far as possible, their particular circumstances.<br>With regard to the special call of December, the evaluation process will include:<br>a) an objective test that will score a maximum of seven points,<br>b) a test to assess knowledge acquired in laboratory practice, which shall not exceed three points. |

| Sources of information | |
|---|---|
| **Basic** | - R.T. Smith, R.B. Minton (2002). Calculus (Second edition). McGraw-Hill<br>- J. Stewart (2001). Cálculo de una variable. Thomson Learning<br>- M.T. Iglesias Otero (2011). MatLab para Cálculo en una variable. Andavira |

| Complementary | - J. de Burgos (2010). Test de cálculo infinitesimal : (enunciados, respuestas y justificación). Madrd : García-Maroto |
| --- | --- |
| | - B.D. Hahn, D.T. Valentine (2007). Essential Matlab for Engineers and Scientistics (3th ed.) . B.H. |
| | - S. Josa (1992). Cómo iniciarse en la resolución de integrales. Edunsa |
| | - S. Lantarón Sánchez, B. Llanas Juárez (2010). Matlab y Matemática Computacional . Bellisco Ediciones |
| | - R. Larson, R. Hostetler, B.H. Edwards (2010). Cálculo Esencial. Cengage Learning |
| | - C. Neuhauser (2004). Matemáticas para Ciencias. Pearson |
| | - A.M. Ramos del Olmo, J.M. Rey Cabezas (2017). Matemáticas básicas para el acceso a la universidad. Ediciones Pirámide, Colección Ciencia y Técnica |
| | Páxina con applets interactivos: dm.udc.es/elearning/Blog existelimite (con exercicios resoltos): www.existelimite.com |

| Recommendations |
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| **Subjects that it is recommended to have taken before** |
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| **Subjects that are recommended to be taken simultaneously** |
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| **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 |