UNIVERSIDADE DA CORUÑA

| Teaching Guide | | | | | |
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| Identifying Data | | | | | 2020/21 |
| Subject (*) | Programming II | | | Code | 614G01006 |
| Study programme | Grao en Enxeñaría Informática | | | | |
| Descriptors | | | | | |
| Cycle | Period | Year | | Type | Credits |
| Graduate | 2nd four-month period | First | | Basic training | 6 |
| Language | SpanishGalicianEnglish | | | | |
| Teaching method | Hybrid | | | | |
| Prerequisites | | | | | |
| Department | Ciencias da Computación e Tecnoloxías da InformaciónComputación | | | | |
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| Web | moodle.udc.es | | | | |
| General description | The subject focuses on programming with dynamic and complex data structures, dealed from the perspective of abstract data types.<br><br>It belongs to the block of subjects of Languages ??and Programming of the Basic Training Module of the degree. It has a strong relationship with the subjects of Programming I, Databases, Algorithms and Software Design. It is also somehow related with mathematical subjects, especially with the Discrete Mathematics subject.<br><br>Regarding the professional profile, many areas of computing require the ability to work with the data structures studied in this subject that will allow students to improve their skills as programmers. | | | | |

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| Contingency plan | 1. Modifications to the contents<br>No changes are anticipated<br><br>2. Methodologies<br>*Teaching methodologies that are maintained<br>Guest lecture / keynote speech<br>Problem solving<br>Laboratory practice<br>Objective test<br><br>All teaching methodologies are maintained, only the media of use changes: Synchronous performance of activities linked to these methodologies through Teams will be maintained, in the time slots assigned to them in the official calendar. These synchronous sessions can be combined with digitized material (videos, presentations, etc.). In the case of the "keynotes speechs", they can be recorded and made available to students through the Moodle platform. In the case of the ?Laboratory practices?, sessions will be held in small groups for follow-up and support in carrying out the proposed activities. Due to technical or organizational teaching needs, students may be assigned to other groups and time slots, subject to a student / teacher agreement. In the event that the exam cannot be done face-to-face, it will be done online.<br><br>*Teaching methodologies that are modified<br>None<br><br>3. Mechanisms for personalized attention to students<br>They will be the same as those enabled under normal conditions (not face-to-face).<br><br>4. Modifications in the evaluation<br>The evaluation conditions contained in the Teaching Guide will not be changed.<br><br>5. Modifications to the bibliography or webgraphy<br>No changes are anticipated |

| Study programme competences | |
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| Code | Study programme competences |
| A3 | Capacidade para comprender e dominar os conceptos básicos de matemática discreta, lóxica, algorítmica e complexidade computacional e a súa aplicación para a resolución de problemas propios da enxeñaría. |
| A4 | Coñecementos básicos sobre o uso e a programación dos ordenadores, sistemas operativos, bases de datos e programas informáticos con aplicación na enxeñaría. |
| B1 | Capacidade de resolución de problemas |
| B3 | Capacidade de análise e síntese |
| C3 | Utilizar as ferramentas básicas das tecnoloxías da información e as comunicacións (TIC) necesarias para o exercicio da súa profesión e para a aprendizaxe ao longo da súa vida. |
| C6 | Valorar criticamente o coñecemento, a tecnoloxía e a información dispoñible para resolver os problemas cos que deben enfrontarse. |

| Learning outcomes | | | |
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| Learning outcomes | Study programme competences | | |
| Understanding the mechanisms of dynamic memory management. | A4 | B1 | C6 |
| Understanding the mechanisms of abstraction in the design of data structures. | A4 | B1<br>B3 | C3<br>C6 |

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| Building specifications, designing the abstract type from them, using appropriate data structures. | A3<br>A4 | B1<br>B3 | C3<br>C6 |
| Using appropriate data structures and program algorithms to solve real problems. | A3<br>A4 | B1<br>B3 | C3<br>C6 |
| Assuming the need for a good specification and a good design as steps prior to coding. | A4 | B3 | C6 |
| Internalizing good programming practices. | A4 | B3 | |

| Contents | |
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| **Topic** | **Sub-topic** |
| Dynamic Memory Management | Program memory organization.<br>Definition of pointer variables.<br>Dynamic memory allocation and deallocation.<br>Pointer assignment and comparison operations. |
| Introduction to Abstract Data Types (ADT) | Abstraction in programming: Concept, Evolution of abstract data types in computer programming, ADT and Object Oriented Programming.<br>Modularity in programming languages.<br>Abstract Data Type (ADT): Definition and concept, Differences between datatype, data structure and ADT, construction of ADT, Advantages of data abstraction. |
| Lists | Informal specification of List ADT.<br>Implementations of List ADT.<br>Ordered list ADT: specification and implementations.<br>Multilists and multiordered lists: concept, representations and usage. |
| Stacks | Informal specification of Stack ADT.<br>Implementations of Stack ADT.<br>Application on computer science. |
| Queues | Informal specification of Queue ADT.<br>Implementations of Queue ADT.<br>Queue variations. Priority queues.<br>Application on computer science. |
| Trees | Tree definition and terminology.<br>Binary Tree ADT: Informal specification, Implementation.<br>Binary Tree traversals. |
| Binary Search Trees | Binary Search Trees.<br>AVL Trees. |

| Planning | | | | |
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| **Methodologies / tests** | **Competencies** | **Ordinary class hours** | **Student?s personal work hours** | **Total hours** |
| Guest lecture / keynote speech | A3 A4 B1 B3 | 30 | 30 | 60 |
| Problem solving | A3 B1 B3 C6 | 10 | 14 | 24 |
| Laboratory practice | A4 B1 B3 C3 C6 | 20 | 26 | 46 |
| Objective test | A3 A4 B1 B3 | 3 | 15 | 18 |
| Personalized attention | | 2 | 0 | 2 |
| **(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.** | | | | |

| Methodologies | |
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| **Methodologies** | **Description** |

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| Guest lecture / keynote speech | Used for theory lectures. The teacher will make a brief description of the topics and objectives , in order to provide students with an overview of the subject. In addition they will establish relationships with other concepts previously acquired to build a timeline, and set out the recommended bibliography. They will then develop the theoretical contents. |
| Problem solving | In order to reinforce the theoretical concepts, practical cases will be presented, which initially will be resolved by the teacher to guide students. As the theoretical development advance, students will solve problems organized into working groups.<br><br>When the examples used in the classes of problems or theoretical explanations involve coding or pseudocode, they will be developed showing the successive steps of top-down design. The reason is twofold: a) to get the student used to employ this method and b ) to avoid being lost in the details of the particular syntax and language features, instead of paying attention to the understanding and design of the solution.<br><br>Additional exercises will be assigned as extra-classroom activities. The student must solve them and comment/correct them with the teacher during group and/or individual tutoring . The purpose is to encourage the participation of students and promote, as far as possible, open dialogue and evaluation of solutions. After each topic, several self-assessment tests will be provided using virtual teaching resources, so that the students can verify their learning progress. |
| Laboratory practice | Practical classes require the students to program data structures in a high-level language. Regular delivery milestones will be proposed to encourage continued study. The practical project assignment will detail the nature of the problem to solve and its specifications, which must be strictly observed. Subsequently, the role of the teacher will be to oversee the practice sessions, solving doubts and correcting misunderstandings, bad programming habits and syntax errors, etc. |
| Objective test | Summative evaluation of the student through a final exam at the end of the semester, which will be very useful for demonstrating whether the student has acquired the skills of abstraction and design of ADTs and is sufficiently trained to use the precise skills to solve practical cases involving the application of such structures. |

| Personalized attention | |
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| **Methodologies** | **Description** |
| Problem solving<br>Laboratory practice<br>Objective test | The development lectures, problem-solving sessions and practical sessions will be carried out taking into account the progress of the students. The general progress of the class will be combined with specific attention to give additional support or expand knowledge. Laboratory practices will be carried out, in part, as autonomous work. For its correct development, periodic monitoring will be necessary to allow students to clear up errors of concept as soon as possible and to ensure the quality of the work.<br>In both cases, Moodle will be used to make available to the students "thematic forums" that resolve the general doubts detected related to specific activities such as the practices or proposed problems.<br>Individual tutoring should not be used to extend the contents with new concepts, but to clarify the concepts already discussed in class. The teacher will use them as an interaction that allows him to draw conclusions about the degree of assimilation of the subject by students. Outside teaching hours, attention is maintained in the official tutoring hours through the following channels:<br>- Email: Of use to make short answer queries.<br>- Teams: virtual meetings preferably upon request via email. |

| Assessment | | | |
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| **Methodologies** | **Competencies** | **Description** | **Qualification** |

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| Problem solving | A3 B1 B3 C6 | The results, form and conditions of completion of various scoring works that will be detailed during the course and that will be resolved during the REDUCED GROUPS TUTORIALS will be assessed.<br><br>The result of the activity, as well as the discussion and active participation in class, will be valued in the final grade.<br><br>This mark will only be added to the remaining marks once the course is passed. | 10 |
| Laboratory practice | A4 B1 B3 C3 C6 | The practical work are mandatory according to the conditions in each problem assignment.<br><br>Students must present and pass all the practical assignments with a global minimum of 4.5 out of 10 points to pass the subject.<br><br>The work submitted must be original of the student. According to article 14, section 4, of existing regulations*, the delivery of non-original works or with duplicate parts (either by copies between colleagues or by obtaining it from any other sources ...) will carry a global mark of FAIL in the ANNUAL CALL, and therefore a failing grade FOR THE TWO OPPORTUNITIES, both for the student who employed copied material and for whoever provides it. | 40 |
| Objective test | A3 A4 B1 B3 | Mandatory completion. It implies a global treatment of the contents covered throughout the subject. It will be eminently practical so that students can demonstrate that they have acquired the necessary knowledge of abstraction and design, implementation and use of TADs and have trained enough in the skills required by the subject.<br><br>It is necessary to obtain a minimum grade of 4.5 out of 10 to pass the subject. | 60 |
| Others | | | |

| Assessment comments |
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| On shared responsibility for group work.<br>In the activities that are carried out in groups, such as the practices, all the members of the group will be jointly responsible for the work carried out and delivered, as well as for the consequences derived from the breach of the rules of authorship.<br>Absent mark<br>Those who do not attend the objective test in the official evaluation period or who do not submit any of the compulsory practices will have the status of "Absent" (No presentado, NP).<br>Second chance evaluation<br>The marks of the "Laboratory practices", as well as the block of "Problem solvig" will be kept for the second opportunity.<br>Only laboratory practices classified as FAIL or ABSENT at the first opportunity may be delivered at the second opportunity, always according to the statement proposed for it. Regarding the evaluation criteria, the second opportunity will remain the same as the first.<br>Part-time enrollment<br><br>Students enrolled part-time will have to submit the evaluable activities under the specific conditions and deadlines that will be established. It will be the duty of the student to communicate their situation to the teaching staff.<br>Advanced Opportunity in December<br>The evaluation of this opportunity will be based exclusively on a written test.<br>* Normativa de evaluación, revisión y reclamación de las<br>calificaciones de los estudios de grado y máster universitario,<br>aprobadas por<br>Consello de Goberno de la Universidade da Coruña el 19 de diciembre de<br>2013. http://www.udc.es/export/sites/udc/normativa/_galeria_down/academica/avaliacionrevrecl.pdf |

| Sources of information | |
|---|---|
| Basic | - Narasimha Karumanchi (2017). Data Structures and Algorithms Made Easy, 5th Edition. CareerMonk Publications<br>- Ignacio Zahonero y Luis Joyanes Aguilar (2004). Algoritmos y estructuras de datos: Una perspectiva en C. McGraw-Hill<br>- Kyle Loudon (1999). Mastering Algorithms with C. O'Reilly Media<br><br /> |
| Complementary | - Reema Thareja (2014). Data Structures Using C - Second Edition. Oxford University Press<br>- Aaron M. Tenenbaum,? Yedidyah Langsam &? Moshe J. Augenstein (1989). Data Structures Using C. Prentice Hall<br>- Richard F. Gilberg & Behrouz A. Forouzan (2005). Data Structures: A Pseudocode Approach with C (2nd Ed). Cengage Learning<br>- Ignacio Zahonero y Luis Joyanes Aguilar (2005). Programación en C. Metodología, Algoritmos y Estructura de Datos, 2º Edición. McGraw-Hill<br>- Luis Joyanes Aguilar, Andrés Castillo Sanz, Lucas Sánchez García e Ignacio Zahonero Martínez (2002). Programación en C. Libro de problemas. McGraw-Hill<br>- Ignacio Zahonero, Lucas García Sánchez, Luis Joyanes Aguilar y Matilde Fernández Azuela (2005). Estructuras de datos en C (Serie Schaum). McGraw-Hill<br>Páxina oficial da contorna de desenvolvemento CLion: https://www.jetbrains.com/clion/ |

| Recommendations |
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| Subjects that it is recommended to have taken before |
| Programming I/614G01001<br>Computer Science Preliminaries/614G01002<br>Discrete Mathematics/614G01004 |
| Subjects that are recommended to be taken simultaneously |
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| Subjects that continue the syllabus |

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| Algorithms/614G01011 |
| Databases/614G01013 |
| Programming Paradigms/614G01014 |
| Software Design/614G01015 |
| **Other comments** |
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**(*)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.**