



## Teaching Guide

| Teaching Guide      |                             |        |                       |           |
|---------------------|-----------------------------|--------|-----------------------|-----------|
| Identifying Data    |                             |        |                       | 2022/23   |
| Subject (*)         | Programming Fundamentals    |        | Code                  | 631G02561 |
| Study programme     | Grao en Tecnoloxías Mariñas |        |                       |           |
| Descriptors         |                             |        |                       |           |
| Cycle               | Period                      | Year   | Type                  | Credits   |
| Graduate            | 1st four-month period       | Fourth | Optional              | 6         |
| Language            | SpanishGalician             |        |                       |           |
| Teaching method     | Face-to-face                |        |                       |           |
| Prerequisites       |                             |        |                       |           |
| Department          | Enxeñaría de Computadores   |        |                       |           |
| Coordinador         | Vidal Paz, Jose             | E-mail | jose.vidal.paz@udc.es |           |
| Lecturers           |                             | E-mail |                       |           |
| Web                 | moodle.udc.es/              |        |                       |           |
| General description |                             |        |                       |           |

## Study programme competences

| Code | Study programme competences                                                                                                                                                                                                                                                    |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A2   | CE2 - Capacidade para a dirección, organización e operación das actividades obxecto das instalacións marítimas no ámbito da súa especialidade.                                                                                                                                 |
| A13  | CE13 - Levar a cabo automatizacións de procesos e instalacións marítimas.                                                                                                                                                                                                      |
| A14  | CE14 - Avaliación cualitativa e cuantitativa de datos e resultados, así como a representación e interpretación matemáticas de resultados obtidos experimentalmente.                                                                                                            |
| A15  | CE15 - Manexar correctamente a información procedente da instrumentación e sintonizar controladores, no ámbito da súa especialidade.                                                                                                                                           |
| A16  | CE16 - Ensambalar e realizar tarefas básicas de mantemento e reparación de equipos informáticos. Instalar e manexar sistemas operativos e aplicacións informáticas. Instalar e realizar as tarefas básicas de xestión de redes de ordenadores, no ámbito da súa especialidade. |
| A17  | CE17 - Modelizar situacións e resolver problemas con técnicas ou ferramentas físico-matemáticas.                                                                                                                                                                               |
| A18  | CE18 - Redacción e interpretación de documentación técnica.                                                                                                                                                                                                                    |
| A20  | CE20 - Ser capaz de identificar, analizar e aplicar os coñecementos adquiridos nas distintas materias do Grao, a unha situación determinada formulando a solución técnica máis axeitada dende o punto de vista económico, ambiental e de seguridade.                           |
| A67  | CE57 - Facer funcionar os ordenadores e redes informáticas a bordo dos buques                                                                                                                                                                                                  |
| A69  | CE59 - Manter e reparar os sistemas de control automático da máquina propulsora principal e das máquinas auxiliares                                                                                                                                                            |
| B2   | CT2 - Resolver problemas de forma efectiva.                                                                                                                                                                                                                                    |
| B5   | CT5 - Traballar de forma colaboradora.                                                                                                                                                                                                                                         |
| B8   | CT8 - Versatilidade.                                                                                                                                                                                                                                                           |
| B9   | CT9 - Capacidade para a aprendizaxe de novos métodos e teorías, que lle doten dunha gran versatilidade para adaptarse a novas situacións.                                                                                                                                      |
| C3   | 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.                                                                                           |
| C5   | C5 - Entender a importancia da cultura emprendedora e coñecer os medios ao alcance das persoas emprendedoras.                                                                                                                                                                  |
| C7   | C7 - Asumir como profesional e cidadán a importancia da aprendizaxe ao longo da vida.                                                                                                                                                                                          |
| C9   | CB1 - Demostrar que posúen e comprenden coñecementos na área de estudo que parte da base da educación secundaria xeneral, e que inclúe coñecementos procedentes da vangardía do seu campo de estudo                                                                            |
| C10  | CB2 - Aplicar os coñecementos no seu traballo ou vocación dunha forma profesional e poseer competencias demostrables por medio da elaboración e defensa de argumentos e resolución de problemas dentro da área dos seus estudos                                                |
| C11  | CB3 - Ter a capacidade de reunir e interpretar datos relevantes para emitir xuízos que inclúan unha reflexión sobre temas relevantes de índole social, científica ou ética                                                                                                     |
| C12  | CB4 - Poder transmitir información, ideas, problemas e solucións a un público tanto especializado como non especializado.                                                                                                                                                      |



|     |                                                                                                                                        |
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| C13 | CB5 - Ter desenvolvido aquelas habilidades de aprendizaxe necesarias para emprender estudos posteriores con un alto grao de autonomía. |
|-----|----------------------------------------------------------------------------------------------------------------------------------------|

| Learning outcomes                                                                             |                                 |                      |                                     |
|-----------------------------------------------------------------------------------------------|---------------------------------|----------------------|-------------------------------------|
| Learning outcomes                                                                             | Study programme competences     |                      |                                     |
| Using a structured programming language                                                       | A13<br>A15                      | B8<br>B9             | C3                                  |
| Knowing the steps to build a program and its main components                                  | A13<br>A17                      |                      |                                     |
| Knowing the control structures of the structured programming and the differences among them   | A13                             |                      |                                     |
| Knowing how to develop programs to solve small- and medium-size problems                      | A2<br>A13<br>A16<br>A17<br>A20  | B2<br>B5<br>B8<br>B9 | C3<br>C9<br>C10<br>C11<br>C13       |
| Building correct, well-organized and documented programs                                      | A13<br>A16<br>A17<br>A18<br>A67 |                      | C3<br>C11<br>C12                    |
| Acquiring good habits linked to programming                                                   | A18                             | B5<br>B8<br>B9       | C3<br>C5<br>C7<br>C11<br>C12<br>C13 |
| Knowing the different ways to organise data: variables, constants, arrays, structs, pointers. | A13<br>A14                      |                      |                                     |
| Ser capaz de depurar e reprogramar sistemas de control automático                             | A67<br>A69                      |                      |                                     |

| Contents                 |                                                                                |
|--------------------------|--------------------------------------------------------------------------------|
| Topic                    | Sub-topic                                                                      |
| 1. INTRODUCTION          | 1.1. MICROCONTROLLERS<br>1.2. PROGRAMMING LANGUAGE                             |
| 2. TYPES AND EXPRESSIONS | 2.1. DATA TYPES<br>2.2. OPERATORS<br>2.3. EXPRESSIONS                          |
| 3. CONTROL FLOW          | 3.1. SEQUENTIAL<br>3.2. ALTERNATIVE<br>3.3. REPETITIVE                         |
| 4. FUNCTIONS             | 4.1. RETURN VALUE<br>4.2. ARGUMENTS<br>4.3. INITIALIZATION<br>4.4. RECURSIVITY |
| 5. DATA STRUCTURES       | 5.1. ARRAYS<br>5.2. POINTERS<br>5.3. STRUCTS                                   |



|                                 |                                                                                          |
|---------------------------------|------------------------------------------------------------------------------------------|
| 6. OBJECT ORIENTED PROGRAMMING  | 6.1. OBJECTS, ATRIBUTES AND METHODS<br>6.2. CLASSES AND INHERITANCE<br>6.3. POLYMORPHISM |
| 7. LIBRARIES                    | 7.1. SPECIFIC LIBRARIES FOR MICROCONTROLLERS                                             |
| 8. CONTROL POR MICROCONTROLADOR | 8.1. CONTROL DO SISTEMA DE PROPULSIÓN<br>8.2. CONTROL DOS SISTEMAS AUXILIARES            |

| Planning                                                                                                                        |                                                                                     |                      |                               |             |
|---------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------|-------------------------------|-------------|
| Methodologies / tests                                                                                                           | Competencies                                                                        | Ordinary class hours | Student's personal work hours | Total hours |
| Laboratory practice                                                                                                             | A13 A14 A15 A16<br>A17 A20 A67 A69 B2<br>B8 B9 C3                                   | 7                    | 14                            | 21          |
| Supervised projects                                                                                                             | A2 A13 A14 A15 A16<br>A18 A20 A67 A69 B2<br>B5 B8 B9 C3 C5 C7<br>C9 C10 C11 C12 C13 | 14                   | 28                            | 42          |
| Guest lecture / keynote speech                                                                                                  | A17 B9 C5 C7                                                                        | 21                   | 21                            | 42          |
| Personalized attention                                                                                                          |                                                                                     | 45                   | 0                             | 45          |
| (*)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            | A series of exercises will be proposed so that the student learns to develop simple algorithms. Thus, the student will be able to solve the problems that arise to him, using for this the control structures and basic data types of a programming language. |
| Supervised projects            | A supervised project, related to his professional field, will be proposed. It will allow the student to integrate the knowledge acquired not only in this subject, but also in other subjects of the degree.                                                  |
| Guest lecture / keynote speech | The lecturer will describe the contents of each topic, relating them to the concepts previously acquired. Then he will develop the theoretical contents using slides and practical examples.                                                                  |

| Personalized attention         |                                                                                                                                                                                       |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Methodologies                  | Description                                                                                                                                                                           |
| Guest lecture / keynote speech | In the laboratory practice sessions, the students will be advised in the resolution of the proposed exercises.                                                                        |
| Laboratory practice            | Students will also be advised during the development of the supervised project that has to be carried out throughout the course.                                                      |
| Supervised projects            | In the lectures, the professor will resolve the doubts that arise so that the student can assimilate the concepts studied and relate them correctly to those seen in previous topics. |

| Assessment          |                                                   |                                                        |               |
|---------------------|---------------------------------------------------|--------------------------------------------------------|---------------|
| Methodologies       | Competencies                                      | Description                                            | Qualification |
| Laboratory practice | A13 A14 A15 A16<br>A17 A20 A67 A69 B2<br>B8 B9 C3 | Resolution and submission of the laboratory exercises. | 45            |



|                     |                                                                                     |                                                                  |    |
|---------------------|-------------------------------------------------------------------------------------|------------------------------------------------------------------|----|
| Supervised projects | A2 A13 A14 A15 A16<br>A18 A20 A67 A69 B2<br>B5 B8 B9 C3 C5 C7<br>C9 C10 C11 C12 C13 | Realization, presentation and defense of the supervised project. | 55 |
|---------------------|-------------------------------------------------------------------------------------|------------------------------------------------------------------|----|

#### Assessment comments

The evaluation criteria present in table A-III/6 of the STCW Code, and included in the Quality Assurance System, will be taken into account when designing and carrying out the evaluation.

#### Sources of information

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Basic</b>         | <ul style="list-style-type: none"><li>- Antonakos, J.L. y Mansfield Jr., K.C. (2004). Programación Estructurada en C. Prentice Hall</li><li>- García Carballeira, F.; Calderón Mateos, A.; Carretero Pérez, J.; Fernández Muñoz, J. y Pérez Menor, (2003). Problemas Resueltos de Programación en Lenguaje C. Thomson</li><li>- Torrente Artero, O. (2016). El Mundo Genuino-Arduino. Curso Práctico de Formación. RC Libros</li></ul> |
| <b>Complementary</b> | <ul style="list-style-type: none"><li>- Kernighan, B.W. y Ritchie, D.M. (1991). El Lenguaje de Programación C. Prentice Hall</li><li>- Stroustrup, B. (2013). The C++ Programming Language. Pearson</li><li>- Banzi, M. y Shiloh, M. (2016). Introducción a Arduino. Anaya</li><li>- Ganazhapa, B.O. (2016). Arduino. Guía Práctica. RC Libros</li></ul>                                                                               |

#### Recommendations

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

Regulation and Control Fundamentals/631G02257

Digital Electronics/631G02364

Power and Analogue Electronics/631G02363

Networks and Communications/631G02366

Sensors and Instrumentation/631G02369

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

Electronic Communication Systems and Navigation Aids/631G02457

Electronic Systems for Data Acquisition/631G02562

##### Subjects that continue the syllabus

##### 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.