



## Teaching Guide

| Teaching Guide      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |        |                                                                                                                                                                                |           |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Identifying Data    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |        |                                                                                                                                                                                | 2020/21   |
| Subject (*)         | Operating Systems                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |        | Code                                                                                                                                                                           | 614G01016 |
| Study programme     | Grao en Enxeñaría Informática                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |        |                                                                                                                                                                                |           |
| Descriptors         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |        |                                                                                                                                                                                |           |
| Cycle               | Period                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Year   | Type                                                                                                                                                                           | Credits   |
| Graduate            | 1st four-month period                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Second | Obligatory                                                                                                                                                                     | 6         |
| Language            | SpanishGalicianEnglish                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |        |                                                                                                                                                                                |           |
| Teaching method     | Hybrid                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |        |                                                                                                                                                                                |           |
| Prerequisites       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |        |                                                                                                                                                                                |           |
| Department          | Ciencias da Computación e Tecnoloxías da InformaciónComputación                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |        |                                                                                                                                                                                |           |
| Coordinador         | Barreiro Garcia, Álvaro                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | E-mail | alvaro.barreiro@udc.es                                                                                                                                                         |           |
| Lecturers           | Barreiro Garcia, Álvaro<br>Cabalar Fernandez, Jose Pedro<br>Fariña Martinez, Antonio<br>Martín Rodilla, Patricia<br>Paris Fernandez, Javier<br>Santos Reyes, Jose<br>Yañez Izquierdo, Antonio Fermin                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | E-mail | alvaro.barreiro@udc.es<br>pedro.cabalar@udc.es<br>antonio.farina@udc.es<br>patricia.martin.rodilla@udc.es<br>javier.paris@udc.es<br>jose.santos@udc.es<br>antonio.yanez@udc.es |           |
| Web                 | http://www.dc.fi.udc.es/~so-grado/                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |        |                                                                                                                                                                                |           |
| General description | Introductory course to Operating Systems dealing with File Systems, Memory, Input/Output, Processes and Concurrency. Practical examples are included using modern OS like Unix and its descendants.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |        |                                                                                                                                                                                |           |
| Contingency plan    | 1. Modifications to the contents<br>Without modifications<br>2. Methodologies<br>*Teaching methodologies that are maintained<br>All<br>*Teaching methodologies that are modified<br>None<br>3. Mechanisms for personalized attention to students<br>Mail, moodle, teams.<br><br>For this subject individual assistance to student is planned via Teams, moodle and mail since the beginning of the course. Also, there is a group where the theoretical lectures are done in the virtual classroom via Teams. All other groups for theoretical lectures and laboratory classes would change to the virtual classroom via Teams in case of need.<br><br>4. Modifications in the evaluation<br>none<br>*Evaluation observations:<br><br>5. Modifications to the bibliography or webgraphy<br>None |        |                                                                                                                                                                                |           |

## Study programme competences

| Code | Study programme competences                                                                                                                                  |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A4   | Coñecementos básicos sobre o uso e a programación dos ordenadores, sistemas operativos, bases de datos e programas informáticos con aplicación na enxeñaría. |



|     |                                                                                                                                                                                                                                                        |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A16 | Coñecemento das características, funcionalidades e estrutura dos sistemas operativos, e deseñar e implementar aplicacións baseadas nos seus servizos.                                                                                                  |
| B1  | Capacidade de resolución de problemas                                                                                                                                                                                                                  |
| B2  | Traballo en equipo                                                                                                                                                                                                                                     |
| B3  | Capacidade de análise e síntese                                                                                                                                                                                                                        |
| B4  | Capacidade para organizar e planificar                                                                                                                                                                                                                 |
| B5  | Habilidades de xestión da información                                                                                                                                                                                                                  |
| B6  | Toma de decisións                                                                                                                                                                                                                                      |
| B7  | Preocupación pola calidade                                                                                                                                                                                                                             |
| B9  | Capacidade para xerar novas ideas (creatividade)                                                                                                                                                                                                       |
| C1  | Expresarse correctamente, tanto de forma oral coma escrita, nas linguas oficiais da comunidade autónoma.                                                                                                                                               |
| C2  | Dominar a expresión e a comprensión de forma oral e escrita dun idioma estranxeiro.                                                                                                                                                                    |
| 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.                                                                        |
| C4  | Desenvolverse para o exercicio dunha cidadanía aberta, culta, crítica, comprometida, democrática e solidaria, capaz de analizar a realidade, diagnosticar problemas, formular e implantar solucións baseadas no coñecemento e orientadas ao ben común. |
| C6  | Valorar criticamente o coñecemento, a tecnoloxía e a información dispoñible para resolver os problemas cos que deben enfrontarse.                                                                                                                      |
| C7  | Asumir como profesional e cidadán a importancia da aprendizaxe ao longo da vida.                                                                                                                                                                       |
| C8  | Valorar a importancia que ten a investigación, a innovación e o desenvolvemento tecnolóxico no avance socioeconómico e cultural da sociedade.                                                                                                          |

| Learning outcomes                                                                                                                                 |  |                             |                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------|--|-----------------------------|----------------------------------------------|
| Learning outcomes                                                                                                                                 |  | Study programme competences |                                              |
| C1 - C8 (See Nuclear competences of the studies)                                                                                                  |  |                             | C1<br>C2<br>C3<br>C4<br>C6<br>C7<br>C8       |
| Knowledge of the characteristics, functionalities and structure of operating systems and design and implement applications based on its services. |  | A4<br>A16                   |                                              |
| B9-B17 (Transversal capacities: see study competences)                                                                                            |  |                             | B1<br>B2<br>B3<br>B4<br>B5<br>B6<br>B7<br>B9 |

| Contents     |                                            |
|--------------|--------------------------------------------|
| Topic        | Sub-topic                                  |
| Introduction | Introduction<br>OS Concepts<br>OS Services |



|                                 |                                                                                                                                             |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Process management & scheduling | Processes<br>Process Control Block<br>Process States<br>Process Scheduling. Algorithms<br>Process communications<br>Unix Processes          |
| Memory management               | Basic Concepts<br>Segmentation & Pagination<br>Virtual memory. Page replacement<br>Examples of current systems<br>Memory management in Unix |
| File Systems                    | File Systems.<br>Methods for assignment and accounting<br>Directory structures<br>Protection<br>Unix File Systems                           |
| Input/Output                    | Basic concepts.<br>Memory-mapped and port-mapped I/O<br>Polling and Direct Memory Access for I/O<br>I/O software layers                     |

| Planning                                                                                                                        |                                                     |                      |                               |             |
|---------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|----------------------|-------------------------------|-------------|
| Methodologies / tests                                                                                                           | Competencies                                        | Ordinary class hours | Student's personal work hours | Total hours |
| Laboratory practice                                                                                                             | A4 A16 B1 B2 B3 B4<br>B5 B6 B7 B9 C2 C3<br>C4 C6 C7 | 20                   | 20                            | 40          |
| Supervised projects                                                                                                             | B1 B6 B7 B9 C1 C2<br>C3 C4 C6 C7 C8                 | 10                   | 20                            | 30          |
| Objective test                                                                                                                  | A4 A16 B1 B9 C1 C6<br>C8                            | 4                    | 20                            | 24          |
| Guest lecture / keynote speech                                                                                                  | A4 A16 B7 C1 C4 C6<br>C7 C8                         | 30                   | 21                            | 51          |
| Personalized attention                                                                                                          |                                                     | 5                    | 0                             | 5           |
| (*)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            | Laboratory assignments. Systems programming,                |
| Supervised projects            | Problems and projects to do under the teacher's supervision |
| Objective test                 | Written exam                                                |
| Guest lecture / keynote speech | Lectures with contents detailed in step 3                   |

| Personalized attention                     |                                                                                                                                            |
|--------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Methodologies                              | Description                                                                                                                                |
| Laboratory practice<br>Supervised projects | The teacher will individually respond to the questions of students about the work to do in laboratory assignments, problems and exercises. |



| Assessment          |                                                     |                                                                                                                                                                                                                                                                   |               |
|---------------------|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Methodologies       | Competencies                                        | Description                                                                                                                                                                                                                                                       | Qualification |
| Laboratory practice | A4 A16 B1 B2 B3 B4<br>B5 B6 B7 B9 C2 C3<br>C4 C6 C7 | The students must finish and send their laboratory assignments according with the established procedures and correctly answer the teacher's questions about their work during the hours of practical laboratory classes. The maximum score of this part is 2.5/10 | 25            |
| Objective test      | A4 A16 B1 B9 C1 C6<br>C8                            | The written exam can contain question about the contents of the lectures, problems, exercises and laboratory assignments, The maximum score of this part is 7.5/10 It is required to obtain a 40% of the score in this part to pass the subject.                  | 75            |

| Assessment comments                                                                                                    |
|------------------------------------------------------------------------------------------------------------------------|
| The students that do not get the minimum required in th objective test can only get a maximum score of 4.5 (out of 10) |
| Partial time students have the same scale of qualifications and continuous assessment as other students                |

| Sources of information |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Basic</b>           | <ul style="list-style-type: none"> <li>- Gary Nutt (). Sistemas Operativos. Addison Wesley</li> <li>- William Stallings (). Sistemas Operativos. Prentice Hall</li> <li>- Andrew S. Tanenbaum (). Sistemas Operativos Modernos. Pearson</li> <li>- Bach (). The design of the unix operating system. Prentice Hall</li> <li>- Vahalia (). Unix internals: the new frontiers. Prentice Hall</li> <li>- Márquez García (). Unix: programacion avanzada. Ra-ma</li> <li>- Samuel J. Leffler, Marshall Kirk McKusick, et al. (). The Design and Implementation of the 4.3 BSD UNIX Operating System. Addison-Wesley</li> <li>- Abrahan Sibersschatz et al (). Operating System Concepts . Wiley</li> </ul> |
| <b>Complementary</b>   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

| Recommendations                                                 |
|-----------------------------------------------------------------|
| <b>Subjects that it is recommended to have taken before</b>     |
| Computer Science Preliminaries/614G01002                        |
| Programming II/614G01006                                        |
| Computer Structure/614G01012                                    |
| <b>Subjects that are recommended to be taken simultaneously</b> |
| Networks/614G01017                                              |
| <b>Subjects that continue the syllabus</b>                      |
| Concurrency and Parallelism/614G01018                           |
| Computer Security and Legislation/614G01024                     |
| Infrastructure Management/614G01025                             |
| Operating Systems Administration/614G01047                      |
| Operating Systems Administration/614G01212                      |
| <b>Other comments</b>                                           |
|                                                                 |

(\*)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.