



IDENTIFYING DATA

Operating Systems

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|---------------------|--|----------|------|------------|
| Subject | Operating Systems | | | |
| Code | V05G300V01541 | | | |
| Study programme | Degree in Telecommunications Technologies Engineering - In extinction | | | |
| Descriptors | ECTS Credits | Choose | Year | Quadmester |
| | 6 | Optional | 3rd | 1st |
| Teaching language | Spanish | | | |
| Department | | | | |
| Coordinator | Pazos Arias, José Juan | | | |
| Lecturers | Pazos Arias, José Juan Ramos Cabrer, Manuel | | | |
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| Web | http://fatic.uvigo.es | | | |
| General description | The aim of this subject is that the student was able to learn the foundations of the current operating systems and to comprise its importance inside the architecture of a computer. | | | |

Competencies

| | |
|------|--|
| Code | |
| B3 | CG3: The knowledge of basic subjects and technologies that enables the student to learn new methods and technologies, as well as to give him great versatility to confront and adapt to new situations |
| B4 | CG4: The ability to solve problems with initiative, to make creative decisions and to communicate and transmit knowledge and skills, understanding the ethical and professional responsibility of the Technical Telecommunication Engineer activity. |
| B9 | CG9: The ability to work in multidisciplinary groups in a Multilanguage environment and to communicate, in writing and orally, knowledge, procedures, results and ideas related with Telecommunications and Electronics. |
| C33 | CE33/TEL7 The ability to program network and distributed applications and services. |
| D2 | CT2 Understanding Engineering within a framework of sustainable development. |
| D3 | CT3 Awareness of the need for long-life training and continuous quality improvement, showing a flexible, open and ethical attitude toward different opinions and situations, particularly on non-discrimination based on sex, race or religion, as well as respect for fundamental rights, accessibility, etc. |
| D4 | CT4 Encourage cooperative work, and skills like communication, organization, planning and acceptance of responsibility in a multilingual and multidisciplinary work environment, which promotes education for equality, peace and respect for fundamental rights. |

Learning outcomes

| Expected results from this subject | Training and Learning Results | | |
|---|-------------------------------|-----|----|
| The knowledge of basic subjects and technologies that capacitates the student to learn new methods and technologies, as well as to give him great versatility to confront and update to new situations | B3 | | D3 |
| Knowledge of the main concepts and the principles of design of the operating systems. | B3 | | D3 |
| Ability to identify the components of an operating system, recognise its functions and the interrelationships between them. | B3 | | D3 |
| Knowledge of the latest advances and tendencies related with operating systems | B3 | | D3 |
| The ability to solve problems with initiative, to make creative decisions and to communicate and transmit knowledge and skills, understanding the ethical and professional responsibility of the Technical Telecommunication Engineer activity. | B4 | | D2 |
| Acquisition of basic skills for the configuration and the utilisation of operating system services. | B9 | C33 | D4 |
| Manage and know the operative associated to the administration of current operating systems. | B3 | | D3 |

| Contents | |
|---|--|
| Topic | |
| Introduction and general perspective of the Operating systems | • Concept of operating system. • Structure of an operating system. • Types of operating systems. • Emulation and virtualization. |
| Processor management. | • Concept of process and thread. • Strategies of allocation of capacity of computation. |
| Memory management. | • Strategies of contiguous allocation. • Concepts of fragmentation, protection, compaction, relocation and sharing of memory. • Strategies of non-contiguous allocation: paging, segmentation and hybrid methods. • Virtual memory. |
| Permanent storage of the information. | • Functions of a file system. Concepts of file and directory. • Interface with the file system. • File sharing. • File Protection. • File system implementation. • Free space management. • Methods for allocation of space to files. |
| Input/Output (I/O) management. | • I/O Controllers. • I/O Interfaces. • Secondary and tertiary storage. • Disk scheduling. • Management of disk. • Replication and consistency of the information. RAID and RAIN technologies. |

| Planning | | | |
|---------------------------------|-------------|-----------------------------|-------------|
| | Class hours | Hours outside the classroom | Total hours |
| Lecturing | 20 | 46 | 66 |
| Practices through ICT | 13 | 26 | 39 |
| Workshops | 5 | 30 | 35 |
| Problem and/or exercise solving | 1 | 0 | 1 |
| Laboratory practice | 1 | 0 | 1 |
| Essay | 2 | 6 | 8 |

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

| Methodologies | |
|-----------------------|---|
| | Description |
| Lecturing | Presentation of the ideas, concepts, technics and algorithms of each lesson. This activity develops the CG3, CG4, CT2 and CT3 competencies. |
| Practices through ICT | The students will resolve under the supervision of the professors practical problems that pose in each session of laboratory. This activity develops the CG4, CT2 and CE33 competencies. |
| Workshops | Each group of students will tackle the design and implementation of a software project with half complexity. This task will be realised in successive steps, that will be discussed and validated in each one of the face-to-face sessions. The aim of this methodology of work is to provide a suitable feedback to improve the proposed solutions. This activity develops the CG4, CG9, CT2 and CT4 competencies. |

| Personalized assistance | |
|--------------------------------|--|
| Methodologies | Description |
| Practices through ICT | The professor will be present during the realisation of the practices, answering all the doubts that can arise to the students. |
| Workshops | The professor will be present during the realisation of the workshops, answering all the doubts that can arise to the students. |
| Lecturing | During the development of the master sessions, the students will be able to interrupt and formulate all the questions or doubts that can arise them. |

| Assessment | | | | |
|---------------------------------|--|---------------|-------------------------------|----------|
| | Description | Qualification | Training and Learning Results | |
| Problem and/or exercise solving | Proof of theoretical contents exposed in the master classes. | 60 | B3 B4 | D2 D3 |
| Laboratory practice | Validation of the work realised in the sessions of laboratory. | 20 | B4 | C33 D2 |
| Essay | In the last face-to-face session of workshop, students will deliver and will expose to their mates the design and the proposed solution for their project. This solution will be exposed to debate for students and professors. The professor will do questions to each member of the group, what will allow his individual evaluation. | 20 | B4 B9 | D2 D4 |

Other comments on the Evaluation

The subject can be surpassed by means of Continuous Evaluation according to the following criteria, having opened the possibility to opt by the No Continuous Evaluation anytime until the beginning of the final examination to celebrate the day fixed to such effect in the official calendar of the EET. All those students that opt by the continuous evaluation will consider presented if they evaluate of the part of the work in Workshops.

Continuous evaluation:

The final note will result of the sum of the corresponding notes to the three following components:

1. Three proofs of type short answer questions to evaluate the contents given in the masterclasses. Each proof will take place in one of the master classes, except the last that will realise in one of the sessions of the Workshop.

Punctuation: Up to 2 points each proof. ($T=t_1+t_2+t_3$)

2. One Practical Proof that will realise at the last session of laboratory.

Punctuation: Up to 2 points. (L)

3. Presentation of the Project proposed like work in the sessions of the Workshop.

Punctuation: Up to 2 points. (P)

To pass the subject by Continuous Evaluation will have to give the three following conditions: (i) obtain an equal or upper qualification to 2 points in the group of the tests.; (ii) Upper qualification to 0,75 points in the practical proof; and (iii) to attend all the face-to-face sessions and obtain more than 0 points in the presentation of the project. In the case to fulfil the three previous conditions, the final mark of the continuous evaluation will be the sum of the three components ($Mark=T+L+P$). If the student does not fulfil any of the three conditions, the mark of the continuous evaluation will be the minimum of the marks obtained in each one of the three components.

No Continuous Evaluation:

By means of an examination on 10 points scheduled in the official calendar of the EET.

Second Opportunity and Extraordinary Evaluation:

It will be governed by the indicated for the No Continuous evaluation.

Sources of information

Basic Bibliography

Abraham Silberschatz, Greg Gagne y Peter B. Galvin, **Operating System Concepts**, 10, Wiley, 2018

Robert Love, **Linux Kernel Development**, 3, Addison-Wesley Professional, 2010

Complementary Bibliography

William Stallings, **Operating Systems: Internals and Design Principles**, 9, Prentice Hall, 2018

Gary Nut, **Operating System : A Modern Perspective**, 3, Addison-Wesley Longman, Inc., 2004

Jesús Carretero, Felix García, Pedro de Miguel y Fernando Pérez, **Sistemas Operativos: Una Visión Aplicada**, 2, McGraw Hill, 2007

Ralf Steinmetz y Klara Nahrstedt, **Multimedia Systems**, 1, Springer, 2004

Frederic Magoules, Jie Pan, Kiat-An Tan y Abhinav Kumar, **Introduction to Grid Computing**, 1, CRC Press, 2009

John Rittinghouse y James Ransome, **Cloud Computing: Implementation, Management, and Security**, 1, CRC Press, 2009

Charles Crowley, **Operating Systems: A Design-Oriented Approach**, 1, McGraw Hill, 1996

Andrew S. Tanenbaum, **Modern Operating Systems**, 4, Prentice Hall, 2014

Daniel P. Bovet y Marco Cesati, **Understanding the Linux Kernel**, 3, O'Reilly Media, 2005

Wolfgang Maier, **Professional Linux Kernel Architecture (Wrox Programmer to Programmer)**, 1, Wrox, 2008

Recommendations

Subjects that continue the syllabus

Distributed and Concurrent Programming/V05G300V01641

Information Systems/V05G300V01644

Subjects that are recommended to be taken simultaneously

Network Security/V05G300V01543

Subjects that it is recommended to have taken before

Informatics: Computer Architecture/V05G301V01109

Programming I/V05G301V01105

Programming II/V05G301V01110

Contingency plan

Description

In the case that it is decided that the teaching is exclusively non-face-to-face, the classes of this subject will be developed in a similar way, but using the telematic platforms provided by the University.

Synchronous virtual classes will be taught weekly through the Campus Remoto tool, both in the theoretical sessions and in the practical sessions. In this second case, students will develop and test the software using their personal computers.

The means enabled for the resolution of the doubts raised by the students will include online consultation forums and tutorials in the teacher's virtual office.

The non-face-to-face assessment of the subject will be governed by the conditions described in the teaching guide for the face-to-face teaching modality, including the same number of tests, identical weighting and minimum grades. The theoretical and practical exams will be carried out virtually, using the platforms provided by the University.