



## Course guide

# 270120 - ASO - Operating Systems Administration

**Last modified:** 30/01/2024

**Unit in charge:** Barcelona School of Informatics  
**Teaching unit:** 701 - DAC - Department of Computer Architecture.

**Degree:** BACHELOR'S DEGREE IN INFORMATICS ENGINEERING (Syllabus 2010). (Optional subject).

**Academic year:** 2023    **ECTS Credits:** 6.0    **Languages:** Catalan, Spanish

### LECTURER

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**Coordinating lecturer:** RENÉ SERRAL GRACIÀ

**Others:**

Primer quadrimestre:  
LEONIDAS KOSMIDIS - 11, 12  
RENÉ SERRAL GRACIÀ - 11, 12

Segon quadrimestre:  
ENRIQUE MORANCHO LLENA - 11, 12  
RENÉ SERRAL GRACIÀ - 11, 12

### PRIOR SKILLS

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- Resources, components and basic architecture of computers
- Basics of operating systems
- Basics of the user-level environment of the operating system: shell commands and basic graphical environment
- elements that make up the network environment
- Basic network protocols and their relationship with the operating system

### REQUIREMENTS

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- Prerequisite SO
- Pre-Corequisite XC

## DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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### Specific:

CT2.3. To design, develop, select and evaluate computer applications, systems and services and, at the same time, ensure its reliability, security and quality in function of ethical principles and the current legislation and normative.

CT2.5. To design and evaluate person-computer interfaces which guarantee the accessibility and usability of computer systems, services and applications.

CT3.6. To demonstrate knowledge about the ethical dimension of the company: in general, the social and corporative responsibility and, concretely, the civil and professional responsibilities of the informatics engineer.

CT6.1. To demonstrate knowledge and capacity to manage and maintain computer systems, services and applications.

CT6.3. To demonstrate knowledge about the characteristics, functionalities and structure of the Operating Systems allowing an adequate use, management and design, as well as the implementation of applications based on its services.

CT6.4. To demonstrate knowledge and capacity to apply the characteristics, functionalities and structure of the Distributed Systems and Computer and Internet Networks guaranteeing its use and management, as well as the design and implementation of application based on them.

CT7.2. To evaluate hardware/software systems in function of a determined criteria of quality.

CT7.3. To determine the factors that affect negatively the security and reliability of a hardware/software system, and minimize its effects.

CT8.4. To elaborate the list of technical conditions for a computers installation fulfilling all the current standards and normative.

CTI1.1. To demonstrate understanding the environment of an organization and its needs in the field of the information and communication technologies.

CTI1.2. To select, design, deploy, integrate and manage communication networks and infrastructures in a organization.

CTI1.4. To select, design, deploy, integrate, evaluate, build, manage, exploit and maintain the hardware, software and network technologies, according to the adequate cost and quality parameters.

CTI2.2. To administrate and maintain applications, computer systems and computer networks (the knowledge and comprehension levels are described in the common technical competences).

CTI4. To use methodologies centred on the user and the organization to develop, evaluate and manage applications and systems based on the information technologies which ensure the accessibility, ergonomics and usability of the systems.

### Generical:

G7. AUTONOMOUS LEARNING: to detect deficiencies in the own knowledge and overcome them through critical reflection and choosing the best actuation to extend this knowledge. Capacity for learning new methods and technologies, and versatility to adapt oneself to new situations.

## TEACHING METHODOLOGY

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The teacher explains the basic issues in the theory sessions, while opens discussions among and with the students on various topics. Each theory session includes the proposal of several issues related to the class, for students to work on them independently on their own.

The laboratory sessions follow an evolving line, based on the installation of the operating system and applications for users on it. The lab sessions are based on the well-defined lab book, and the teacher performs the necessary support to students, which functions similar to a senior manager training to novel and junior administrators.

## LEARNING OBJECTIVES OF THE SUBJECT

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- 1.Knowledge about the system administrator, with his/her responsibilities and tasks.
- 2.Plan the basic installation of the systems in an organization.
- 3.Learn to prepare an installation of the operating system, perform the installation, and the post-installation.
- 4.Manage user accounts, add users, modify users, get information on users, deactivate users, and remove users.
- 5.Use and modify the permissions and protection mechanisms offered by the operating systems on devices and files.
- 6.Learn to install, maintain, and manage applications for the organization.
- 7.Learn to monitor the operating system, users, resources, and applications.
- 8.Learn to maintain the resources and the file system in a good condition, and to perform backups.
- 9.Manage the system services, and periodic tasks
- 10.Learn to configure the main Internet services.
- 11.Configure, verify and maintain the security of the installation.



## STUDY LOAD

Type	Hours	Percentage
Hours small group	30,0	20.00
Self study	84,0	56.00
Hours large group	30,0	20.00
Guided activities	6,0	4.00

**Total learning time:** 150 h

## CONTENTS

### Introduction

**Description:**

- Definition of concepts
- Levels
- Responsibilities
- law and Code of Ethics Administrator
- Security

### Installation of the operating system

**Description:**

- Concepts
- Preparation
- Boot the system
- Tools and post-configuration
- File System Structure

### User Management

**Description:**

- Mechanisms of identification
- System User's database
- Permissions and protections
- Changing privileges

### Application Management

**Description:**

- Installation
- Mechanisms
- Maintenance



## Monitoring

### Description:

- Resources to monitor
- Monitoring mechanisms
- Signals
- Tools

## File System Maintenance

### Description:

- Types of filesystems
- Journalling
- Disk integrity
- Filesystems management
- Logical volumes
- Backups

## Local Services management

### Description:

- Service management
- Periodic tasks
- Removable devices
- Virtualization

## Network Services Management

### Description:

- Network services
- Internet Services
- Maintenance and configuration of network services

## Protection and Security

### Description:

- Techniques to improve system security
- Insecure Services
- Common types of attacks
- Common Solutions



## ACTIVITIES

### Presentation of the course and Introduction to Systems Administration

**Specific objectives:**

1, 2, 11

**Related competencies :**

G7. AUTONOMOUS LEARNING: to detect deficiencies in the own knowledge and overcome them through critical reflection and choosing the best actuation to extend this knowledge. Capacity for learning new methods and technologies, and versatility to adapt oneself to new situations.

CTI4. To use methodologies centred on the user and the organization to develop, evaluate and manage applications and systems based on the information technologies which ensure the accessibility, ergonomics and usability of the systems.

**Full-or-part-time:** 4h

Theory classes: 2h

Self study: 2h

### Operating system installation

**Specific objectives:**

2, 3, 11

**Related competencies :**

G7. AUTONOMOUS LEARNING: to detect deficiencies in the own knowledge and overcome them through critical reflection and choosing the best actuation to extend this knowledge. Capacity for learning new methods and technologies, and versatility to adapt oneself to new situations.

CTI4. To use methodologies centred on the user and the organization to develop, evaluate and manage applications and systems based on the information technologies which ensure the accessibility, ergonomics and usability of the systems.

**Full-or-part-time:** 10h

Theory classes: 2h

Laboratory classes: 4h

Self study: 4h

### User management

**Specific objectives:**

1, 4, 5, 11

**Related competencies :**

G7. AUTONOMOUS LEARNING: to detect deficiencies in the own knowledge and overcome them through critical reflection and choosing the best actuation to extend this knowledge. Capacity for learning new methods and technologies, and versatility to adapt oneself to new situations.

CTI4. To use methodologies centred on the user and the organization to develop, evaluate and manage applications and systems based on the information technologies which ensure the accessibility, ergonomics and usability of the systems.

**Full-or-part-time:** 10h

Theory classes: 2h

Laboratory classes: 6h

Self study: 2h



### Applications management

**Specific objectives:**

1, 5, 6, 11

**Related competencies :**

G7. AUTONOMOUS LEARNING: to detect deficiencies in the own knowledge and overcome them through critical reflection and choosing the best actuation to extend this knowledge. Capacity for learning new methods and technologies, and versatility to adapt oneself to new situations.

CTI4. To use methodologies centred on the user and the organization to develop, evaluate and manage applications and systems based on the information technologies which ensure the accessibility, ergonomics and usability of the systems.

**Full-or-part-time:** 11h

Theory classes: 2h

Laboratory classes: 4h

Guided activities: 1h

Self study: 4h

### Monitoring

**Description:**

The student participates actively in the session through group discussions, about the different monitoring techniques on system resources. Prepare a monitoring report on the monitoring support offered by operating systems.

**Specific objectives:**

1, 7

**Related competencies :**

CTI4. To use methodologies centred on the user and the organization to develop, evaluate and manage applications and systems based on the information technologies which ensure the accessibility, ergonomics and usability of the systems.

**Full-or-part-time:** 9h

Theory classes: 2h

Laboratory classes: 2h

Guided activities: 1h

Self study: 4h

### File systems maintenance

**Description:**

The student participates actively in the theoretical explanation session working in groups on methods for data backup and makes a report on the tools available.

**Specific objectives:**

1, 3, 8, 11

**Related competencies :**

G7. AUTONOMOUS LEARNING: to detect deficiencies in the own knowledge and overcome them through critical reflection and choosing the best actuation to extend this knowledge. Capacity for learning new methods and technologies, and versatility to adapt oneself to new situations.

CTI4. To use methodologies centred on the user and the organization to develop, evaluate and manage applications and systems based on the information technologies which ensure the accessibility, ergonomics and usability of the systems.

**Full-or-part-time:** 8h

Theory classes: 2h

Laboratory classes: 4h

Self study: 2h



### Local services management

**Description:**

The student participates actively in the session working in groups regarding the appropriate tasks to be performed periodically and techniques available to schedule them. He/she writes a report on systems to support virtualization.

**Specific objectives:**

1, 9, 11

**Related competencies :**

G7. AUTONOMOUS LEARNING: to detect deficiencies in the own knowledge and overcome them through critical reflection and choosing the best actuation to extend this knowledge. Capacity for learning new methods and technologies, and versatility to adapt oneself to new situations.

CTI4. To use methodologies centred on the user and the organization to develop, evaluate and manage applications and systems based on the information technologies which ensure the accessibility, ergonomics and usability of the systems.

**Full-or-part-time:** 10h

Theory classes: 2h

Laboratory classes: 2h

Guided activities: 2h

Self study: 4h

### First partial exam

**Description:**

This test assesses the knowledge and practice acquired in the first nine weeks of the course, including topics 1 to 7.

**Specific objectives:**

1, 2, 3, 4, 5, 6, 7, 8, 9

**Related competencies :**

G7. AUTONOMOUS LEARNING: to detect deficiencies in the own knowledge and overcome them through critical reflection and choosing the best actuation to extend this knowledge. Capacity for learning new methods and technologies, and versatility to adapt oneself to new situations.

CTI4. To use methodologies centred on the user and the organization to develop, evaluate and manage applications and systems based on the information technologies which ensure the accessibility, ergonomics and usability of the systems.

**Full-or-part-time:** 12h

Guided activities: 2h

Self study: 10h



### Management of network services

**Description:**

The student participates actively in group discussions on the proper configuration of network services. He/she writes a report on the available servers for a number of proposed services and the advantages that each one offers.

**Specific objectives:**

1, 10, 11

**Related competencies :**

G7. AUTONOMOUS LEARNING: to detect deficiencies in the own knowledge and overcome them through critical reflection and choosing the best actuation to extend this knowledge. Capacity for learning new methods and technologies, and versatility to adapt oneself to new situations.

CTI4. To use methodologies centred on the user and the organization to develop, evaluate and manage applications and systems based on the information technologies which ensure the accessibility, ergonomics and usability of the systems.

**Full-or-part-time:** 19h

Theory classes: 6h

Laboratory classes: 6h

Guided activities: 1h

Self study: 6h

### Protection and security

**Description:**

The student participates actively in discussions on security and defense against attacks. He/she writes a report on monitoring tools, network analysis and intrusion detection.

**Specific objectives:**

1, 2, 10, 11

**Related competencies :**

G7. AUTONOMOUS LEARNING: to detect deficiencies in the own knowledge and overcome them through critical reflection and choosing the best actuation to extend this knowledge. Capacity for learning new methods and technologies, and versatility to adapt oneself to new situations.

CTI4. To use methodologies centred on the user and the organization to develop, evaluate and manage applications and systems based on the information technologies which ensure the accessibility, ergonomics and usability of the systems.

**Full-or-part-time:** 11h

Theory classes: 4h

Guided activities: 1h

Self study: 6h



### Second partial exam

**Description:**

This partial exam evaluates the knowledge and practice acquired during the course.

**Specific objectives:**

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11

**Related competencies :**

G7. AUTONOMOUS LEARNING: to detect deficiencies in the own knowledge and overcome them through critical reflection and choosing the best actuation to extend this knowledge. Capacity for learning new methods and technologies, and versatility to adapt oneself to new situations.

CTI4. To use methodologies centred on the user and the organization to develop, evaluate and manage applications and systems based on the information technologies which ensure the accessibility, ergonomics and usability of the systems.

**Full-or-part-time:** 12h

Guided activities: 2h

Self study: 10h

### Laboratory exam

**Description:**

In this exam, students solve practical problems related with all course subjects, individually. You can have books and notes.

**Specific objectives:**

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11

**Related competencies :**

G7. AUTONOMOUS LEARNING: to detect deficiencies in the own knowledge and overcome them through critical reflection and choosing the best actuation to extend this knowledge. Capacity for learning new methods and technologies, and versatility to adapt oneself to new situations.

CTI4. To use methodologies centred on the user and the organization to develop, evaluate and manage applications and systems based on the information technologies which ensure the accessibility, ergonomics and usability of the systems.

**Full-or-part-time:** 10h

Guided activities: 2h

Self study: 8h

### Final exam

**Description:**

For those students that would need to reach the minimum level of the course or those that want to raise their marks, this examination will be hold after the period of the classes

**Specific objectives:**

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11

**Related competencies :**

G7. AUTONOMOUS LEARNING: to detect deficiencies in the own knowledge and overcome them through critical reflection and choosing the best actuation to extend this knowledge. Capacity for learning new methods and technologies, and versatility to adapt oneself to new situations.

CTI4. To use methodologies centred on the user and the organization to develop, evaluate and manage applications and systems based on the information technologies which ensure the accessibility, ergonomics and usability of the systems.

**Full-or-part-time:** 24h

Guided activities: 2h

Self study: 22h

## GRADING SYSTEM

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The autonomous learning competence is evaluated based on the reports delivered by the student during the course. Its weight is 10% on the final mark.

The technical competences are evaluated based on the theory (40%) and the laboratory exam (50%).

The theory gets evaluated based on the partial and the final exams. The mark of the 2 partial exams is computed as the averaged mean of the 2 tests, with the following weights: 40 and 60%. If this mark is equal or larger than 5.0, attending the final exam is optional.

In case a student attends the final exam, his/her theory mark will be the highest between the mark obtained in the final exam and the averaged mean of the partial exams.

## BIBLIOGRAPHY

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### Basic:

- Adelstein, T.; Lubanovic, B. Linux system administration. O'Reilly, 2007. ISBN 9780596009526.
- Nemeth, E.; Snyder, G.; Hein, T.R.; Whaley, B.; Mackin, D. UNIX and Linux system administration handbook. 5th ed. Boston: Addison-Wesley, 2018. ISBN 9780134277554.
- Serral Gracià, René. Transparències en anglès.

## RESOURCES

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### Hyperlink:

- <http://docencia.ac.upc.edu/FIB/ASO-GRAU>- <http://tldp.org/LDP/abs/html/>