



Universitat de Lleida

DEGREE CURRICULUM  
**SYSTEMS ADMINISTRATION  
AND VIRTUALIZATION**

Coordination: MATEO FORNES, JORDI

Academic year 2023-24

## Subject's general information

<b>Subject name</b>	SYSTEMS ADMINISTRATION AND VIRTUALIZATION			
<b>Code</b>	102378			
<b>Semester</b>	1st Q(SEMESTER) CONTINUED EVALUATION			
<b>Typology</b>	<b>Degree</b>	<b>Course</b>	<b>Character</b>	<b>Modality</b>
	Bachelor's degree in Digital Interaction and Computing Techniques	3	COMPULSORY	Attendance-based
<b>Course number of credits (ECTS)</b>	6			
<b>Type of activity, credits, and groups</b>	<b>Activity type</b>	PRALAB		TEORIA
	<b>Number of credits</b>	3		3
	<b>Number of groups</b>	1		1
<b>Coordination</b>	MATEO FORNES, JORDI			
<b>Department</b>	COMPUTER ENGINEERING AND DIGITAL DESIGN			
<b>Teaching load distribution between lectures and independent student work</b>	<p>Globally, the subject has 150 hours of work spread over 60 hours and 90 hours of individual student work.</p> <p>6 ECTS = 25 * 6 = 150 hours of work</p> <p>40% -&gt; 40 face-to-face hours</p> <p>60% -&gt; 90 hours of autonomous student work</p>			
<b>Important information on data processing</b>	Consult <a href="#">this link</a> for more information.			
<b>Language</b>	Catalan (in Spanish if any student shows difficulties with Catalan). The material of the subject in English.			
<b>Distribution of credits</b>	Jordi Mateo Fornés (6)			

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
MATEO FORNES, JORDI	jordi.mateo@udl.cat	6	By prior appointment. The place and time will be agreed by email.

## Subject's extra information

To study this subject it is recommended to have some experience in **Linux or Unix** environments. It must have a basis for the main functions of the **Operating System** (*What is it? How does it work? How is it structured? ... How the Operating System looks and feels from the user's perspective*). Therefore, this course is a continuation of the **Operating Systems** course and it is recommended to have passed the subject, as well as to have the key concepts, as they are the starting point (base) for the **Systems Administration**. It is also recommended to have experience working in **text mode** and with **scripting** languages, without the need for GUI applications.

In this subject I will take the first steps in real cloud systems (**Amazon Web Services**).

## Learning objectives

- Gain a basic knowledge of Systems Administration.
  - Design systems according to user requirements.
  - Install
  - Configuration
  - Maintain
  - Protect systems and information
- Identify threats and plan strategies to prevent them and to build emergency and contingency plans.
- Gain a basic knowledge of resource virtualization and its relationship with Systems Administration.
- Know the basics of cloud systems.
- Be able to use and manage cloud platforms (AWS).
- Be able to do research on technologies and determine which technology is best suited to the needs of the user.

## Competences

### Basic:

- CB3: That students have the ability to gather and interpret relevant data (usually within their area of study) to make judgments that include a reflection on relevant social, scientific or ethical issues.

### Transversals:

- CT3: Acquire training in the use of new technologies and information and communication technologies.
- CT6: Apply the gender perspective to the tasks of the professional field.

### Generals:

- CG3: Capacity to use appropriate hardware and software platforms for the development and execution of interactive digital applications.

### Specific:

- CE3: Basic knowledge of the use and programming of computers, operating systems and databases, and their use in the development of interactive applications.

- *CE7*: Know, manage and maintain systems, services and interactive applications.
- *CE11*: Knowledge of the characteristics, functionalities and structure of operating systems and design and implement applications based on their services.

## Subject contents

### Topic 1: Introduction

- What is a Systems Administrator?
- Where to start
- Historical evolution
- Methodology
- Regulations and Policies
- TIPS and recommendations

### Topic 2: Basic Administration

- Root user
- Bash + AWK + SED
- Process control: The file system / proc
- Pathnames
- Organization and Hierarchy
- File Types and Attributes
- ACL
- Booting
- Service management
- Software management and installation
- User management

### Topic 3: Storage

- Discs
- Partitions
- Logical volumes
- Hierarchy
- RAIDS
- Backups

### Topic 4: Basic Security

- Access Control
- Basic cryptography
- SSH
- Firewalls
- Encryption with LUKS

### Topic 5: Basic Maintenance

- Periodic processes
- Logging
- Monitoring

### Topic 6: Virtualization

- Concepts and need
- Types of virtualization
- Hypervisors
- KVM
- Docker

## Cloud Computing - AWS:

- M1 - Introduction to Cloud Computing and AWS
- M2 - Economy in the cloud
- M3 - AWS infrastructure
- M4 - Cloud security
- M5 - Virtual networks
- M6 - Cloud computing
- M7 - Cloud storage
- M8 - Cloud databases
- M9 - Architecture in the cloud
- M10 - Automatic monitoring and scaling.

## Methodology

### Theory

- In these sessions, the theoretical contents of the subject will be explained, accompanied by illustrative examples.
- An active methodology is used where the student is the protagonist (**HandsOn**).
- The slides on the subject will be used as support material.

### Practices

- **Blended Learning.** An active and asynchronous methodology allows students to progress and learn at their own pace. Through **HandsOn**, the teacher guides and accompanies students in solving activities. This content is self-sufficient; the teacher only encourages discussion and helps resolve doubts.

### Self-employment

- The **Flipped Classroom** methodology will be applied where the student must review resources before the sessions.
- Completion of the **HandsOn** and the proposed challenges.
- Completion of the **AWS Cloud Practitioner** course.
- Realization of a Project.

This course will enable students to take the official **AWS Cloud Practitioner** certification.

## Development plan

### Observations:

- The development plan is indicative and can be modified at any time, depending on the pace of learning and the evolution of the course. The name and number of **HandsOn** is provisional and subject to change.
- The **theory and practice** sessions are combined in the two class days to promote content exposure.
- The **HandsOn** and the **Project** have hours in the classroom to be worked on and completed. If not, they will have to be completed at home.

# SYSTEMS ADMINISTRATION AND VIRTUALIZATION 2023-24

		Monday	Homework	Tuesday	Homework	Sunday
		15:00 - 16-50		17:10 - 19:00		23:55
		Teoria - Pralab (A03)		Teoria - Pralab (A03)		Deliveries
September	1a	Holidays (11 sept)		Presentation of the course Unit 1: Introduction	M1	
	2a	Lab 1: Bash Scripting Hands On 1: Automations I	M1	Lab 1: Bash Scripting Hands On 1: Automations I	M2	Hands On 1
	3a	Lab 2: AWK Hands On 2: Automations II	M2	Lab 2: AWK Hands On 2: Automations II	M2	Hands On 2
October	4a	Unit 2: Basic Administration Hands On 3: Web + DB Server	M3	Unit 2: Basic Administration Hands On 3: Web + DB Server	M3	Hands On 3
	5a	Unit 2: Basic Administration Hands On 4: Lord of the System	M3	Unit 2: Basic Administration Hands On 5: LDAP	M4	Hands On 4
	6a	Unit 2: Basic Administration Hands On 5: LDAP	M4	Unit 2: Basic Administration Hands On 5: LDAP	M4	Hands On 5
	7a	Unit 3: Storage Hands On 6: File System	M5	Unit 3: Storage Hands On 6: File System	M5	Hands On 6
November	8a	Unit 3: Storage Hands On 7: RAIDS	M5	Unit 3: Storage Hands On 8: LVM	M6	Hands On 7
	9a	PARTIALS				
	10a	Unit 3: Storage Hands On 8: LVM	M6	Unit 4: Basic Security Hands On 9: pfSense	M6	Hands On 8
	11a	Unit 4: Basic Security Hands On 9: pfSense	M7	Unit 5: Basic Maintenance Hands On 10: Legacy	M7	Hands On 9
	12a	Unit 5: Basic Maintenance Hands On 10: Legacy	M7	Unit 5: Virtualization Hands On 11: Docker for SysAdmins	M8	Hands On 10
December	13a	Unit 5: Virtualization Hands On 11: Docker for SysAdmins	M8	Unit 5: Virtualization Hands On 11: Docker for SysAdmins	M8	Hands On 11
	14a	Project	M9	Project	M9	
	15a	Project	M9	Project	M9	
January	16a	PARTIALS				
	17a					
	18a					
	19a	RECOVERIES				

## Evaluation

- To have passed the subject, the **FINAL GRADE** must be *greater than or equal* to 5.
- **HandsOns** are optional , can not be recovered and must be delivered by the dates indicated. **If any HandsOn is not programmed; res will calculate the individual weights of the activities (HandsOn) carried out equitably. The block will always weigh the weight indicated in the table.**
- The **AWS** block is optional, it is not recoverable, its items can be completed until the last session of the

subject. **After this session, it will no longer be taken into account for the calculation of the final grade.**

- The **partials** consist of two parts that will take place on the same day:
  - Theory: Written test that will evaluate the practical and theoretical content of the subject.
  - Practice: Practical test carried out with a computer.
- Partials can be recovered through a written test taken during the recovery week.

BLOCK	ACTIVITIES	WEIGHT	RECOVERABLE	MINIMUM MARK	GROUP
Partial 1		22,5%	YES	YES > 5	NO
	Theory 1	10 %	NO	NO	NO
	Practice 1	12,5 %	NO	NO	NO
Partial 2		22,5%	YES	YES > 5	NO
	Theory 2	10 %	NO	NO	NO
	Practice 2	12,5 %	NO	NO	NO
Project		17,5%	NO	NO	YES
	Functionalities	10,0%	NO	NO	YES
	Oral Defense	7,5%	NO	NO	YES
HandsOn		27,5%	NO	NO	YES
	Hands On 1	2,5%	NO	NO	YES
	Hands On 2	2,5%	NO	NO	YES
	Hands On 3	2,5%	NO	NO	YES
	Hands On 4	2,5%	NO	NO	YES
	Hands On 5	2,5%	NO	NO	YES
	Hands On 6	2,5%	NO	NO	YES
	Hands On 7	2,5%	NO	NO	YES
	Hands On 8	2,5%	NO	NO	YES
	Hands On 9	2,5%	NO	NO	YES
	Hands On 10	2,5%	NO	NO	YES
	Hands On 11	2,5%	NO	NO	YES
AWS		10 %	NO	NO	NO
	M1	1%	NO	NO	NO
	M2	1%	NO	NO	NO
	M3	1%	NO	NO	NO
	M4	1%	NO	NO	NO
	M5	1%	NO	NO	NO
	M6	1%	NO	NO	NO
	M7	1%	NO	NO	NO
	M8	1%	NO	NO	NO
	M9	1%	NO	NO	NO
	M10	1%	NO	NO	NO

\*\*\*Keeping personal notes about your learning on github will have an extra bonus of up to **0.5** points in the **FINAL GRADE** (*following the guidelines/instructions published in the course resources*).

## Alternative Evaluation

- Students who have the approval to be assessed through alternative assessment ([see requirements and procedure in the assessment regulations](#)) must carry out the following activities.
- There will be a written test (70%) and a practical test (30%) that will contain all the practical and theoretical content of the subject. This written test will have a weight of 100% and will be carried out on the day reserved in the calendar for the completion of the second part of the subject (consult the exam calendar for more information).
- The recovery will be a written test with a weight of 100% and will be carried out on the day reserved in the calendar for the recovery of the second part of the subject (consult the exam calendar for more information).

## Bibliography

- Gancarz, Mike . Linux and the Unix Philosophy. Boston: Digital Press, 2003.
- Nemeth, Evi,Snyder, Garth,Hein, Trent R.,Whaley, Ben,Mackin, Dan. UNIX and Linux System Administration Handbook. Pearson Education.
- Mouat, Adrian. Using Docker: Developing and Deploying software with Containers. Sebastopol, CA: O'Reilly Media, 2016.
- Turnbull, James. The Docker Book. [www.dockerbook.com](http://www.dockerbook.com).
- Wittig, Andreas, and Michael Wittig. Amazon Web Services In Action. Manning Publications, 2015.
- Amazon . [youtube.com/AmazonWebServices](https://youtube.com/AmazonWebServices) . Conference talks and other video content from AWS.
- Blum, Richard, and Christine Bresnahan. Linux Command Line and Shell Scripting Bible (3rd Edition). John Wiley & Sons, Inc. 2015