



Universitat de Lleida

DEGREE CURRICULUM **SYSTEMS ADMINISTRATION AND VIRTUALIZATION**

Coordination: MATEO FORNES, JORDI

Academic year 2022-23

Subject's general information

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

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
MATEO FORNES, JORDI	jordi.mateo@udl.cat	6	

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
- 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** and **CodeLabs**, the teacher guides and accompanies students in solving activities. This content is self-sufficient; the teacher only encourages discussion and helps resolve doubts.
- These sessions take place on the AWS platform.

Self-employment

- The **Flipped Classroom** methodology will be applied where the student must review resources before the sessions.
- Completion of complementary activities and problems.
- A scientific conference (**TIDIC-CLOUDOPS**) will be promoted where students in groups will have to work on a disruptive and very current technology related to *Cloud*, *SECDEVOPS*, or *Virtualization*. At the beginning of the course, the students will be given a list of topics to select. They must present some conference proceedings explaining the subject and complement them with a state-of-the-art revision. A comparison should also be made with the advantages and disadvantages of technology, and a real situation should be recommended in which it should be used. Afterwards, each group will make a public presentation on the topic, and a **HandsOn** demonstration of the technology will have to be prepared.

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

Development plan

Week	Theory	Lab (Face-to-Face)	Homework
1	Topic 1: Presentation / Introduction	Cloud Computing - AWS (M1)	Activities HandsOn CloudOps
2	Topic 2: Basic Administration	Cloud Computing - AWS (M2)	
3	Topic 2: Basic Administration	Cloud Computing - AWS (M3)	
4	Topic 3: Storage	Cloud Computing - AWS (M4)	
5	Topic 3: Storage	Cloud Computing - AWS (M5)	
6	Topic 4: Basic security	Cloud Computing - AWS (M6)	
7	Topic 4: Basic security	Cloud Computing - AWS (M6)	
8	Topic 5: Basic Maintenance	Cloud Computing - AWS (M7)	
9	1 st Exam		
10	Topic 6: Virtualization	Cloud Computing - AWS (M8)	
11	Topic 6: Virtualization	Cloud Computing - AWS (M9)	
12	Project	Cloud Computing - AWS (M10)	
13	Project	HOLIDAYS	
14	CloudOps	CloudOps	
15	CloudOps	CloudOps	
16	2 nd Exam		
17			
18			
19	Recovery		

Evaluation

Evaluation Activities	Weight	Minimum Mark	Groups	Recoverable
Partials (E)	20%	NO	NO	YES
<i>Project</i> (P)	15%	NO	YES	NO

Evaluation Activities	Weight	Minimum Mark	Groups	Recoverable
Activities (A)	20%	NO	YES	NO
<i>HandsOn</i> (H)	30%	NO	YES	YES
<i>TIDIC-CLOUDOPS</i> (TCO)	15%	NO	YES	NO
FINAL MARK: 20% E + 15% P + 20% A + 30% H + 15% TCO				
Considerations: <ul style="list-style-type: none"> To pass the course, the FINAL MARK must be <i>greater than or equal</i> to 5. Attendance at sessions, student participation in classroom discussions, <i>slack</i> channels, and keeping personal notes about their learning on <i>github</i> will earn up to 0.5 points in their final grade. In case of plagiarism, the mark of that activity (E,P,A,H,TCO) is 0. The presentation of activities with retard represents a weighting of 75% on the weighting of that activity, for example, if the activity has a weighting of 10% in the final grade, it will have a weighting of 7.5%. Therefore, these activities are not recoverable, since they can be delivered throughout the course but with a 25% penalty. Partials (E) and HandsOn (H) are <u>retrievable</u> through a make-up exam. The partial exams (E) and the recovery exam are carried out on a computer and the consultation of notes is allowed, both the practical and theoretical content of the subject are evaluated. 				

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.
- Wittig, Andreas, and Michael Wittig. Amazon Web Services In Action. Manning Publications, 2015.
- Amazon . 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