Universitat de Lleida

DEGREE CURRICULUM

SYSTEMS ADMINISTRATION AND VIRTUALIZATION

Coordination: MATEO FORNES, JORDI

Academic year 2023-24

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 ENGINEERING AND DIGITAL DESIGN
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.
Distribution of credits	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 15:00 - 16-50 Teoria - Pralab (A03)	Homework	Tuesday 17:10 - 19:00 Teoria - Pralab (A03)	Homework	Sunday 23:55 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:
    - ○ <u>Theory</u>: Written test that will evaluate the practical and theoretical content of the subject.
    - ○ <u>Practice</u>: Practical test carried out with a computer.
- <u>Partials can be recovered</u> 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.
- 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