



Universitat de Lleida

DEGREE CURRICULUM  
**SYSTEMS ADMINISTRATION  
AND VIRTUALIZATION**

Coordination: MATEO FORNÉS, JORDI

Academic year 2020-21

## 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>	Degree	Course	Character	Modality
	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 FORNÉS, JORDI			
<b>Department</b>	COMPUTER SCIENCE AND INDUSTRIAL ENGINEERING			
<b>Teaching load distribution between lectures and independent student work</b>	<p>Globally, the subject has 150 hours of work spread over 60 hours (30 hours face-to-face and 30 hours virtual) and 90 hours of individual student work.</p> <p>6 ECTS = 25 * 6 = 150 hours of work</p> <p>20% -&gt; 30 face-to-face hours</p> <p>20% -&gt; 30 virtual 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.			

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
MATEO FORNÉS, 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.

### Generals:

- CG3: Use adequate hardware and software platforms to develop and execute 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 structures of the operating systems and design

and implement applications based in 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

### Topic 3: File System

- Pathnames
- Mount and Unmount
- Organization and Hierarchy
- File Types and Attributes
- ACL

### Topic 4: Basic Configuration

- Booting
- Service management
- Software management and installation
- User management

### Topic 5: Storage

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

### Topic 6: Basic Security

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

### Topic 7: Basic Maintenance

- Periodic processes
- Logging
- Monitoring

### Topic 8: Virtualization

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

## Topic 9: Cloud Computing

- Cloud type
- Types of services
- Structure
- Security and Privacy

## Methodology

### Virtual Theory

- In these sessions, the theoretical contents of the subject will be explained, accompanied by illustrative examples. The slides of the subject will be used as support material.
- All virtual sessions will be performed using the virtual campus videoconferencing tool and will be recorded for consultation at any moment.

### Practices (Face-to-face Sessions)

- An active methodology is used where the student is the protagonist by means of the **HandsOn**.
- These sessions will be used to work on the most practical parts of the subject.

### Self-employment

- The **Flipped Classroom** methodology will be applied to complement and finish the **HandsOn** that will be started in class.
- A cooperative project-based methodology will be applied, where some case studies will have to be evaluated, designed, and configured by the students.
- 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, you will be given the list of topics to select. They must present some proceedings explaining the subject and complementing 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. Afterward, each group will make a public presentation of the topic and a **HandsOn** demonstration of the technology will have to be prepared.

## Development plan

Week	Theory (Virtual)	Lab (Face-to-Face)	Homework (TIDIC-CLOUDOps)	Homework
1	<b>Topic 1:</b> Presentation / Introduction	Scripting Review	<i>Topic selection &amp; resarch</i>	Project HandsOn
2	<b>Topic 2:</b> Basic Administration	<b>Topic 2:</b> Basic Administration	Abstract + Introduction	
3	<b>Topic 3:</b> File System	<b>Topic 3:</b> File System	<i>State of the art</i>	
4	<b>Topic 4:</b> Basic Configuration	<b>Topic 4:</b> Basic Configuration	<i>Proposal</i>	
5	<b>Topic 4:</b> Basic Configuration	<b>Topic 4:</b> Basic Configuration	<i>HandsOn</i>	
6	<b>Topic 5:</b> Storage	<b>Topic 5:</b> Storage	<i>HandsOn</i>	
7	<b>Topic 6:</b> Basic Security	<b>Topic 6:</b> Basic Security	<i>HandsOn</i>	
8	<b>Topic 7:</b> Basic Maintenance	<b>Topic 7:</b> Basic Maintenance	<i>HandsOn</i>	
9	<b>1<sup>st</sup> Exam</b>			
10	<b>Topic 8:</b> Virtualization	<b>Topic 8:</b> Virtualization	<i>Slides</i>	
11	<b>Topic 9:</b> Cloud Computing	<b>Topic 9:</b> Cloud Computing	<i>Slides</i>	
12	<i>HOLIDAYS</i>	<b>CloudOps</b>	-	
13	<b>CloudOps</b>	<b>CloudOps</b>	-	
14	<u><i>Case Study 1</i></u>	<i>HOLIDAYS</i>	-	
15	<u><i>Case Study 2</i></u>	<u><b>Project Validation</b></u>	-	
16	<b>2<sup>nd</sup> Exam</b>			
17	<b>2<sup>nd</sup> Exam</b>			
18	<b>2<sup>nd</sup> Exam</b>			
19	<b>Recovery</b>			

**NOTES:** In the 20/21 academic year:

- The theory is virtual using the campus video conferencing tool. Sessions will be recorded.
- Laboratory activities (PRALAB) are face-to-face and compulsory attendance.
- **CloudOps** activities are mandatory (depending on the situation, they will be done virtually or in person, as they will be sessions open to the public and interested people.)
- Partial and recoveries are face-to-face. ***Except for a new situation of exceptionalty.***

## Evaluation

Evaluation Activities	Weight	Minimum Mark	Groups	Mandatory	Recoverable
<i>First Exam (P1)</i>	15%	SI >= 5	NO	SI	SI
<i>Second Exam (P2)</i>	15%	SI >= 5	NO	SI	SI
<i>Project (P)</i>	30%	SI >= 5	SI	SI	SI
<i>TIDIC-CLOUDOPS (TCO)</i>	20 %	SI >= 5	SI	SI	SI
<i>HandsOn (HO)</i>	20%	NO	SI	SI	SI
<b>Final mark: 15% P1 + 15% P2 + 30% P + 20% TCO + 20% HO</b>					
*** To pass the course, the final grade must be greater than or equal to 5.					
<b>Considerations:</b>					
<ul style="list-style-type: none"> <li>The <b>examns</b> are done on a computer, and it is allowed consulting class notes, both the practical and theoretical content of the subject is evaluated</li> <li>In case of plagiarism, the grade for that activity is <b>0</b>.</li> <li>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%.</li> <li>An additional <b>0.25</b> points will be awarded to the <u>final grade</u> to the best group in the conference; selected by the professors.</li> </ul>					
<b>Recoveries:</b>					
<ul style="list-style-type: none"> <li><b>HandsOn:</b> They can be recovered with an improved version with a maximum grade of 5. They are recovered individually.</li> <li><b>Examns.</b> They can be recovered by taking a test similar that allows you to obtain a minimum grade of 5 or a maximum of 7.5.</li> <li><b>CloudOps:</b> It can be recovered, presenting an improved version of the proceedings. Maximum recovery score: 5.</li> <li><b>Project:</b> It can be recovered by performing an additional task. Maximum recovery score a 5.</li> </ul>					

## 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