SUBJECT TEACHING GUIDE

G679 - Design and management of Computer Systems

Degree in Computer Systems Engineering

Academic year 2026 - 2027

1. IDENTIFYING DATA					
Degree	Degree in Computer Systems Engineering			Type and Year	Optional. Year 4
Faculty	Faculty of Sciences				
Discipline	Subject Area: Computer Engineering Mention in computer Engingeering				
Course unit title and code	G679 - Design and management of Computer Systems				
Number of ECTS credits allocated	6	Term		Semester based (2)	
Web	http://aulavirtual.unican.es/				
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. INGENIERÍA INFORMÁTICA Y ELECTRÓNICA
Name of lecturer	JOSE ANGEL HERRERO VELASCO
E-mail	joseangel.herrero@gestion.unican.es
Office	Facultad de Ciencias. Planta: + 1. DESPACHO (1102)
Other lecturers	

3.1 LEARNING OUTCOMES
Understand fundamental aspects of modern operating system design across different platforms, including handheld devices, multimedia systems, multiprocessor architectures, and networked environments, as well as virtualization technologies.
Be able to design and develop new operating system services through programming.
Be capable of performing the tasks and responsibilities of a Systems Administrator in data center environments.
Be able to apply and manage advanced (mass) storage systems, as well as handle advanced backup and recovery management systems.
Be familiar with and proficient in the use of advanced tools for centralized system monitoring and configuration.
Be able to properly configure TCP/IP networking in server systems, and understand the principles and mechanisms for building local area networks (LANs).
Be able to configure, secure, and administer both basic and advanced network services.
Be familiar with and able to use tools and services for managing systems and networks across different platforms.

Understand and apply principles of energy efficiency in the design and operation of data centers.

4. OBJECTIVES
This course aims to broaden the knowledge acquired by students in the "Computer Systems" course, providing a more advanced and specialized perspective on computer systems administration:
1. Understand the fundamental role of the Systems Administrator in data center environments, including responsibilities, professional best practices, operational philosophies, and management tools.
2. Understand and be able to use the main tools and systems for monitoring, supervision, and configuration management of IT systems and services.
3. Work on the design, deployment, and integration of IT systems for the implementation of advanced services related to computational information management, network services, mass storage, and resource sharing within INTRANET environments.
4. Work on the design and deployment of advanced services for WEB content publishing and electronic mail (e-mail) management within INTERNET service environments.
5. Analyze and implement basic security mechanisms to ensure the protection and hardening of the core services deployed through the IT systems studied.
6. Understand the fundamental aspects of data centers in terms of organization, design, management, measurement, and energy efficiency.

6. COURSE ORGANIZATION	
CONTENTS	
1	PROLOGUE: Introduction to Computer Systems Administration Fundamentals of the Systems Administrator Role - Formal definition of the systems administrator role - Tasks, duties, and responsibilities - Best practices and documentation - DevOps methodologies and incident management
2	UNIT 1: Remote Tools for Monitoring and Configuration of Services and Servers 1. Centralized IT configuration and automation: ANSIBLE 2. IT monitoring and alerting systems: PROMETHEUS, GRAFANA
3	INIT 2: IT Integration for the Deployment of Global Services I: INTRANET 1. IT Systems for Information Management and User Validation - Secure directory services (LDAP): openLDAP and TLS/SSL - Directory integration mechanisms; identification and authentication: NSS, PAM, SSS 2. IT Systems for the Management of Auxiliary Network Services - Dynamic Host Configuration Protocol (DHCP) service: ISC DHCP - Local Domain Name System (DNS) service: ISC Bind9
4	UNIT 3: IT Integration for the Deployment of Global Services II: STORAGE 1. IT systems for large-scale storage management: OpenZFS 2. IT systems for network file management and resource sharing: - Distributed and network file service: NFSv4 - Resource sharing and cross-platform interoperability service (SMB): SAMBA
5	UNIT 4: IT Integration for the Deployment of Global Services III: INTERNET 1. IT systems for web hosting management: Apache2 HTTP Server 2. IT systems for e-mail management: SMTP (Postfix), IMAP (Dovecot)
6	EPILOGUE: Introduction to Data Centers Fundamentals of Data Center Design and Operation - Formal definition of a data center - Design, structure, and operational aspects of data centers - Energy efficiency (PUE), monitoring, and maintenance - Tier classification

7. ASSESSMENT METHODS AND CRITERIA				
Description	Type	Final Eval.	Reassessment	%
Evaluación Continua (EC): Five partial exams will be conducted throughout the course. Each will consist of a written test covering the theoretical content taught in class up to that point, corresponding to the four teaching units of the course, as well as	Written exam	No	Yes	40,00
Examen Final (EF): It will consist of a practical exercise made up of several case studies that the student must develop and solve on a virtual machine running on the laboratory computers.	Laboratory evaluation	Yes	Yes	60,00
TOTAL				100,00
Observations				
Observations for part-time students				

8. BIBLIOGRAPHY AND TEACHING MATERIALS
BASIC
UNIX & LINUX System Administration Handbook (5th Edition) Autor: Evi Nemeth, Garth Snyder, Trent R. Hein, Ben Whaley, Dan Mackin Editorial: 5th Edition. Addison-Wesley Professional, 2017. ISBN-13: 978-0-13-427755-4 ISBN-10: 0-13-427755-4