COMILLAS
UNIVERSIDAD PONTIFICIA
ICAI ICADE CIHS

Syllabus
2024 - 2025

GENERAL INFORMATION

Data of the subject	
Subject name	Distributed Systems
Subject code	DTC-GITT-415
Mainprogram	Bachelor's Degree in Engineering in Telecommunication Technologies
Involved programs	Grado en Ingeniería en Tecnologías de Telecomunicación [Fourth year]
Level	Reglada Grado Europeo
Quarter	Semestral
Credits	6,0 ECTS
Type	Optativa (Grado)
Department	Department of Telematics and Computer Sciencies
Coordinator	Luis Francisco Sánchez Merchante
Office hours	To be communicated on the first day

Teacher Information

DESCRIPTION OF THE SUBJECT

Contextualization of the subject

Prerequisites

Programming and operating systems knowledge

Course contents

Contents

Block Theory

THEME 1: INTRODUCTION TO DISTRIBUTED SYSTEMS.

1.1. Definition.
1.2. Evolution.
1.3. Models, architectures and components of distributed systems.

THEME 2: DISTRIBUTED ARCHITECTURES

2.1. Different models of C/S architectures.
2.2. Middleware software layers (CORBA, RMI, DCOM).
2.3. Design requirements

THEME 3: DISTRIBUTED PROGRAMMING (MULTIPROCESS/MULTITHREADING).

3.1. Inter-process communication via sockets (UDP-TCP-IP Multicast).

3.2. Object packaging and serialisation.

3.3. Invocation of remote methods and procedures (RMI, RPC).

3.4. JAVA RMI Implementation

3.5. Practical Lab.

- Communication C/S UDP (Datagram)
- C/S TCP communication (Stream)
- C/S IP Multicast (MultiCasting)

THEME 4. TIME SERVICES

4.1 Clocks (physical and logical), Synchronisation, Status.

THEME 5: ADVANCED DISTRIBUTED ARCHITECTURES

5.1. Parallel and distributed systems, Grid Computing, Clustering.

5.2. Blockchain

5.3. REST architectures

5.4. Practical Lab.

- Implement Blockchain platform
- Implementing a REST service

THEME 6: DISTRIBUTED STORAGE

6.1. Distributed file systems.

- NFS (Network File System)
- GFS (Google File System)
- HDFS (Hadoop Distributed File System).
- Redis
- Elasticsearch

6.2. Distributed Storage in a transactional environment.

- Basic concepts of DBMS architecture
- Concurrency and transaction control protocols
- Transaction scheduling (serial/parallel)
- Log-based recovery
- Replication and consistency (2-phase commit)
- Planning exercises

6.3. Practical Lab.

- Install and configure a network file system (NFS)
- Install and configure a Redis cluster and perform benchmarks.

EVALUATION AND CRITERIA

Evaluation activities	Evaluation criteria	Weight
Theoretical and Practical Exams	**Ordinary Exam.** This grade constitutes 80% of the Final Grade. It is divided into 50% from practical exams conducted throughout the course and 30% from a theoretical exam held at the end of the course. **Extraordinary Exam.** This grade constitutes 80% of the Final Grade. It is divided into 15% from practical exams conducted throughout the course and 65% from a theoretical exam held in the extraordinary session.	80
Student Participation, Intermediate Work, and Final Project	This grade constitutes 20% of the final grade	20

BIBLIOGRAPHY AND RESOURCES

Basic References

- DISTRIBUTED SYSTEMS: CONCEPTS AND DESIGN. Kindberg, Tim ; Dollimore, Jean; Coulouris, George. PEARSON ADDISON-WESLEY.
- DISTRIBUTED OPERATIVE SYSTEMS. Tanenbaum, Andrew S. PEARSON-PRENTICE HALL.

Complementary References

- DISTRIBUTED COMPUTING: PRINCIPLES AND APPLICATIONS. Liu, Mei-Ling . ADDISON WESLEY.
- HADOOP: THE DEFINITIVE GUIDE, Third Edition. Tom White. O'Reilly Media. ISBN: 978-1-449-31152-0.
- BLOCKCHAIN: BLUEPRINT FOR A NEW ECONOMY.. Melanie Swan. O'Reilly Media. ISBN-13: 978-1491920497