



GENERAL INFORMATION

Data of the subject	
Subject name	Distributed Systems
Subject code	DTC-GITT-415
Main program	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	Optional
Department	Department of Telematics and Computer Sciences
Coordinator	Luis Francisco Sánchez Merchante
Office hours	To be communicated on the first day

Teacher Information	
Teacher	
Name	Luis Francisco Sánchez Merchante
Department	Department of Telematics and Computer Sciences
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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
Examen	<p>In Ordinary Exam:</p> <ul style="list-style-type: none"> • In order to pass the subject, the mark of the Ordinary Examination must be equal or higher than 5. <p>In Extraordinary Exam:</p> <ul style="list-style-type: none"> • In order to pass the subject, the mark of the Extraordinary Examination must be equal or higher than 5. • The percentage for the grade of the Extraordinary Exam will be: (65% Extraordinary Examination + 35% Laboratory Practicals). 	60 %
Labs	This grade makes up 30% of the Final Grade of the Ordinary Exam.	30 %
Student participation, extra work and class tests	This grade makes up 10% of the Final Grade of the Ordinary Examination.	10 %

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



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