SUBJECT TEACHING GUIDE

324 - Networks and Distributes Systems

Master's Degree in computing engineering

Academic year 2023-2024

1. IDENTIFYING DATA					
Degree	Master's Degree in computing engineering			Type and Year	Compulsory. Year 1
Faculty	Faculty of Sciences				
Discipline	COMPUTER ENGINEERING				
Course unit title and code	324 - Networks and Distributes Systems				
Number of ECTS credits allocated	6	Term		Semester based (1)	
Web					
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. INGENIERÍA INFORMÁTICA Y ELECTRÓNICA
Name of lecturer	ENRIQUE VALLEJO GUTIERREZ
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Other lecturers	PATRICIA LOPEZ MARTINEZ

3.1 LEARNING OUTCOMES
- Be able to formulate the workload and performance of a distributed system (applications, OS and network) in order to specify its performance and scalability.
- Model distributed systems based on probabilistic queueing networks and evaluate their performance both analytically and by simulation.
- Know practical techniques for measuring a distributed system performance and estimating its model paramenters, based on traffic monitors, OS activity and code execution.
- Know the details of internal routing mechanisms and techniques used to increase their scalability.
- Understand the difficulties in IP addressing and be able to apply IPv6 migration techniques.
- Know the organization and protocols employed for Internet Service Provicers communication.

4. OBJECTIVES
Be able to apply advanced configuration in enterprise environments, including IPv6 transition mechanisms.
Understand the transfer of information between different autonomous systems in Internet , and the main techniques used for branch connectivity, being able to design the solutiona and analyze the involved protocols.
Learn and be able to aply basic network evaluation techniques based on simulation.
Be able to specify the performance requirements of a distributed system, its load model and its scalability.
Know the methodology employed for distributed systems modelling based on probabilistic queueing networks and evaluation techniques both analitic and simulation based.
Be able to measure the performance of a distributed system based on standard monitors, and evaluate its parameter models.

6. COURSE ORGANIZATION	
CONTENTS	
1	Introduction. Fundamentals. TCP/IP model. Routing mechanisms. Distributed systems.
2	Internal routing mechanisms. Techniques to increase the scalability. Use of multiple routing areas. Multipath routing. Policy-based routing and virtual links. Path redistribution. IPv6 use and transtion mechanisms.
3	Routing mechanisms in Internet. Autonomous system. BGP and MPLS. Encapsulation mechanisms: VPNs and SSH tunnels.
4	Network automation, programmability and virtualization. Software Defined Networks (SDN). Network Function Virtualization (NFV). Programmable data plane. Mechanisms for network automation.
5	Specification, modelling and evaluation of distributed systems performance.
5.1	Performance metrics and load models.
5.2	Probabilistic queueing models: formulation and analysis techniques.
5.3	Instrumental techniques for model estimation.
5.4	Model analysis and simulation techniques.
5.5	Project about performance and scalability analysis of a distributed system.
6	Final exam

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Work on the part of Distributed systems.	Laboratory evaluation	No	Yes	33,33
Networking laboratory.	Laboratory evaluation	No	Yes	16,67
Computer networks examination	Written exam	Yes	Yes	50,00
TOTAL				100,00

Observations

If the maximum number of highest grades (Matricula de Honor) is reached in the ordinary evaluation period, students following the extraordinary evaluation will not be eligible to this grade.

Observations for part-time students

Part-time students will be allowed to embrace the continuous evaluation model. Otherwise, they will have a single exam in the evaluation periods, which will comprise a theoretical section and an applied section with problems. Additionally, the student will have to present a summary of the work and lab sessions results, formatted according to the guidelines provided by the teacher. For this model, the students will need to contact the teacher and the beginning of the course.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

D.A. Menascé, V.A.F.Almeida y L.W. Dowdy: “Performance by Design” Prentice Hall, 2004.

W. Odom: "CCNP Route 642-902 Official Certification Guide", Cisco Press, 2010.

W. Stallings: "Data and computer communications", 10th Ed. Pearson, 2013.