

COMPUTER NETWORKS

Degree in Computer Systems

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Code: 10306

Main Scientific Area: Computer Architecture, Distributed Systems and Cybersecurity

Lecturer: José Paulo Fernandes Macedo

Language of Instruction: Portuguese

Regime: S1

Contact Hours: 60h Total Workload: 100h

ECTS: 6,0

Objectives

This curriculum unit has the main objective of presenting the basic concepts of computer networks, including technologies, architectures, and protocols that serve as the foundation for device communication on the Internet. It also aims to teach the design, development, and implementation of network infrastructures using IPv4 and IPv6 protocols.

This study will primarily focus on the three lower layers that comprise the OSI model and will be complemented by practical work conducted in the computer networks lab

Learning Outcomes

Students who successfully complete this curricular unit should be able to:

1. Gain a comprehensive understanding of the various elements of a communication system, their functions, and relationships.
2. Familiarize themselves with various types of telecommunications networks, with special emphasis on Ethernet local area networks.
3. Acquire knowledge about the primary transmission media and communication devices.
4. Comprehend the relationship between the OSI model and the TCP/IP architecture.
5. Explain, define, and implement addressing and routing in IPv4 and IPv6 networks.
6. Develop and implement network infrastructure projects for both IPv4 and IPv6 environments.

Course Contents

1. Introduction to Computer Networks
2. Types of Transmission Signals

3. Principles of Data Transmission
4. Network Architecture and Types
5. Network Topologies
6. Local Area Network (LAN) Technologies
7. Medium Access Control
8. Network Components and Equipment
9. OSI Model and TCP/IP Architecture
10. Internetworking
11. Network Protocols ARP and ICMP
12. IPv4 Protocol
13. IPv4 Fragmentation and Reassembly
14. IPv4 Addressing, Address Classes, and Subnet Masks
15. NAT/PAT Protocol
16. CIDR and VLSM Subnetting
17. VLANs (Virtual Local Area Networks)
18. IPv4 Routing
19. Introduction and Study of IPv6 Protocol
20. IPv6 Addressing and Routing
Definition, Implementation, and Configuration of a Network Infrastructure (Practical Work)

Recommended Bibliography

Tanenbaum, Feamster Wetherall, Computer Networks, 6th edition, Pearson Education Limited, 2021.

Walter Goralski, The Illustrated Network: How TCP/IP Works in a Modern Network, 2nd ed, Morgan Kaufmann, 2017. Stallings, W., Data and Computer Communications, 10th Edition, Prentice-Hall, 2013.

Learning and Teaching Methods

By acquiring the knowledge taught in the syllabus, students will be able to gain a comprehensive understanding of the various components of a communication network system, their functions, and relationships. They will comprehend the primary types of communication networks, with a particular focus on Ethernet local networks and

the Internet communications infrastructure. Students will also grasp the fundamental transmission systems and key communication devices, in addition to understanding the correlation between the OSI model and the TCP/IP architecture.

Regarding the TCP/IP protocol suite, students will be capable of explaining and implementing addressing and routing in both IPv4 and IPv6 networks, while also mastering CIDR/VLSM subnetting, NAT/PAT, and VLANs. Furthermore, they will be able to comprehend and implement the primary network protocols that exist within the three lower layers of the OSI model.

Assessment Methods

The evaluation consists of two major components: a theoretical component, which carries a 60% weight, and a practical component, which contributes 40% to the final grade.

A minimum score of 7.5 points is required in the assessment tests, and a minimum of 9 points in the final practical work.

The final grade must be greater than or equal to 10 points for approval. The weighted values are on a scale from 0 to 20 points.