

Program and Rules

Redes de Comunicações II

**Licenciatura em
Engenharia de Computadores e Informática
DETI-UA**



Professors

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UC Informations

- All materials, documents and software will be available on eLearning.ua.pt (Moodle).
 - Subjected to weekly updates.

Flexible office hours

- Email (to discuss any topic or schedule a meeting).
- Discord: Invite <https://discord.gg/bPPpKy5>
 - ➔ **Change your nick to your real name** (First and Last names).
 - ➔ **Ask RC2 student role.**
 - ➔ Only after you will have access to the course contents.



Objectives and Outcomes

- The objective of the course is to present students with:
 - ♦ Essential concepts in computer networks;
 - ♦ Identifying the fundamentals applied to the control and transport of data.
- It is intended that at the end the students should:
 - ♦ Have an understanding of the underlying fundamentals of communication networks;
 - ♦ Understand new technologies and concepts of communication networks;
 - ♦ Be able to use their knowledge to respond to current changes in communication networks.



Program

- Local Area Networks (LAN)

- Virtual LAN: purpose, implementation, segmentation models, Layer 2 interconnection (802.1Q and VXLAN) and Layer 3 interconnection.
- Spanning Tree-protocol(s).

- Network Design Models

- Types of topology. Redundancy and resilience requirements. Hierarchical design model.

- IP Routing

- Unicast Routing: static, dynamic and police based routing.
- Internal Routing protocols (RIPv1, RIPv2, OSPF, ISIS).
- Internet general AS architecture and core networks. Inter-AS routing (MP-BGP).
- Multicast Routing protocols (IGMP, MLD, PIM-DM, PIM-SM, PIM-SSM).

- Overlay Networks: IP-IP and GRE IP tunnels.

- Core Networks: SDH and DWDM. MPLS.

- (Other) Access Networks

- CATV/HFC (DOCSIS), SDH/SONET/GPON,
- Celular networks (4G/5G).

- Communication models: client-server and P2P.

- VoIP Service: SIP and WebRTC.

- Sensor Networks: BT, Zigbee, LoRA, NB-IoT.



Evaluation

- Final Grade = $50\% * \text{Theory Grade} + 50\% * \text{Practice Grade}$
 - There are no minimum grade for any component.
 - Theory grade
 - ➔ 1 Final Exam (100%) in the exam season;
 - ➔ and/or 1 Exam in “repeat exam” season;
 - ➔ The best grade is considered.
 - Practice Grade
 - ➔ 2 multiple choice tests (25%+25%)
 - During practice classes;
 - First test – April 17th, 21st;
 - Second test – May 2nd, 5th.
 - ➔ “Repeat exam” season
 - One single test with all topics.
 - The best grade is considered.



Planning (tentative)

Semana	Teórica (6F-1.5h)	Prática (2h)	Prática (2F-2h)	Prática (6F-2h)	
13/Feb	Program and rules. Local Area Networks (LAN): Virtual LAN: purpose, implementation, segmentation models, Layer 2 interconnection (802.1Q and VXLAN) and Layer 3 interconnection.	TP1: Trabalho GNS3 com SWL3.	TP1	TP1	
20/Feb	Spanning Tree-protocol(s).	TP2: VLAN and Spanning-Tree Protocol	TP2	TP2	
27/Feb	Network Design Models: Types of topology. Redundancy and resilience requirements. Hierarchical design model. CLOS topology.	TP2: VLAN and Spanning-Tree Protocol	TP2	TP2	
06/Mar	IP Unicast Routing: static, dynamic and police based routing. Internal Routing protocols (RIPv1, RIPv2, OSPF, ISIS).	TP2: VLAN and Spanning-Tree Protocol	TP2	TP2	
13/Mar	IP Unicast Routing: static, dynamic and police based routing. Internal Routing protocols (RIPv1, RIPv2, OSPF, ISIS).	TP3: Dynamic Routing	TP3	TP3	
20/Mar	Overlay Networks: IP-IP and GRE IP tunnels.	TP3: Dynamic Routing	TP3	TP3	
27/Mar	Internet general AS architecture and core networks. Inter-AS routing. MP-BGP.	TP3: Dynamic Routing + (Optional) Policy Based Routing	TP3	TP3	
03/Apr	Páscoa	Páscoa	Páscoa	Páscoa	
10/Apr	Internet general AS architecture and core networks. Inter-AS routing. MP-BGP.	TP4: IPv4 tunnels. IPv6 over IPv4 tunneling.	Páscoa	TP4	
17/Apr	Communication models: client-server and P2P. VoIP Service: SIP and WebRTC.	TESTE PRÁTICO	TESTE PRÁTICO	TESTE PRÁTICO	TP1+TP2+TP3
24/Apr	Semana académica		Semana académica	Semana académica	
01/May	IP Multicast Routing: protocols (IGMP, MLD, PIM-DM, PIM-SM, PIM-SSM).		Feriado	TP5	
08/May	Feriado	TP5: MPBGP	TP4	Feriado	
15/May	Traffic Engineering (TE). Multiprotocol Label Switching (MPLS)	TP5: MPBGP	TP5	TP5	
22/May	Core Networks: SDH/SONET and DWDM. (Other) Access Networks: CATV/HFC (DOCSIS), SDH/SONET/GPON, Celular networks (4G/5G). Sensor Networks: 802.15.4, BT, Zigbee, LoRA, NB-IoT+Thread.	TP6: Voip (SIP)	TP5	TP6	
29/May	Revisions.	TESTE PRÁTICO	TP6	TESTE PRÁTICO	TP4+TP5+TP6
05/Jun			TESTE PRÁTICO		TP4+TP5+TP6



Bibliografy

- **Theoretical classes slides.**
- **A Practical Approach to Corporate Networks Engineering, António Nogueira, Paulo Salvador, River Publishers, ISBN-13: 978-8792982094, 2013.**
- **Computer Networks: A Systems Approach, Larry Peterson, Bruce Davie, ISBN-13: 978-0128182000, 6th Edition, 2021.**
- **Computer Networking: a Top-Down Approach, Kurose J., Ross K., 7th edition, Addison Wesley, ISBN-13: 978-9332585492, 2017**
- **Designing for Cisco Network Service Architectures (ARCH), Marwan Al-shawi, Andre Laurent, Cisco Press, 4th edition, ISBN-13: 978-1587144622, 2016.**
- **MPLS in the SDN Era: Interoperable Scenarios to Make Networks Scale to New Services, Antonio Sanchez Monge, Krzysztof Grzegorz Szarkowicz, O'Reilly Media; 1st edition, ISBN-13: 978-1491905456, 2016.**
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- **Engenharia de Redes Informáticas, Edmundo Monteiro, Fernando Boavida, FCA, ISBN-13: 978-972-722-694-8, 10^a Edição Atualizada e Aumentada, 2011 (em português).**

