

230041 - IX - Network Infrastructure

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| Coordinating unit: | 230 - ETSETB - Barcelona School of Telecommunications Engineering |
| Teaching unit: | 744 - ENTEL - Department of Network Engineering |
| Academic year: | 2019 |
| Degree: | BACHELOR'S DEGREE IN NETWORK ENGINEERING (Syllabus 2010). (Teaching unit Compulsory) BACHELOR'S DEGREE IN TELECOMMUNICATIONS SCIENCE AND TECHNOLOGY (Syllabus 2010). (Teaching unit Optional) BACHELOR'S DEGREE IN TELECOMMUNICATIONS TECHNOLOGIES AND SERVICES ENGINEERING (Syllabus 2015). (Teaching unit Optional) |
| ECTS credits: | 6 |
| Teaching languages: | Catalan |

Teaching staff

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| Coordinator: | Hesselbach Serra, Xavier |
| Others: | Hesselbach Serra, Xavier Casademont Serra, Jordi |

Prior skills

Protocols architectures.
Switching strategies.
Definitions and basic concepts in circuits and packets networks.
MAC protocols. Deterministic and random, centralized and distributed.
Protocols and services in Internet (basic level).
Probability and stochastic processes.
Propagation in copper and optical fiber.
Digital signals modulation.

Degree competences to which the subject contributes

Generical:

10 ECI N3. They will have acquired knowledge related to experiments and laboratory instruments and will be competent in a laboratory environment in the ICC field. They will know how to use the instruments and tools of telecommunications and electronic engineering and how to interpret manuals and specifications. They will be able to evaluate the errors and limitations associated with simulation measures and results.

Teaching methodology

Application sessions
Lectures
Laboratory sessions
Works in groups (not in classroom)
Individual works (not in classroom)
Short questions exams (control)
Short questions exams (Test)
Long questions exams (Final exam)
Laboratory exercises

Learning objectives of the subject

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The main goal of this subject is the introduction of the concepts and current technologies in networks infrastructures. The subject shows the physical layer in order to transmit information, services, the data and control planes and the classification of the networks in access, transport and broadcast.

The student will be able to identify and study the problems, the current existing solutions and the tendencies, in order to learn procedures to take decisions among available technologies.

Learning procedure outputs:

- Skills to build, exploit and manage networks, services, processes and applications in telecommunications, from the view of Internet services.
- Understand and use the concepts of quality of service in several scenarios.
- Utilize the tools to build, exploit and manage the Internet services, including web and multimedia information.
- Protocols and interfaces in the protocols architecture, including the knowledge to program them, test and optimize.
- Learn the technological challenges in transmission and switching in networking and services.
- Use of books and papers, including skills to write a report or technical work in english, including the capacity to participate in technical meetings.
- Individual use of the tools and software applications of the labs ranging from basic to advances concepts. Discover the procedures and limitations.

Study load

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| Total learning time: 150h | Hours large group: | 39h | 26.00% |
| | Hours small group: | 26h | 17.33% |
| | Self study: | 85h | 56.67% |

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Content

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| <p>Topic 1. Introduction.</p> | <p>Learning time: 14h Theory classes: 2h Laboratory classes: 6h Self study : 6h</p> |
| <p>Description: Concepts review Definitions</p> <p>Related activities: Lab: Introduction and fundamental concepts.....(3 weeks) Types of devices and wires Devices configuration Topologies Parameters and metrics Evaluation tools</p> | |
| <p>Topic 2. Access networks</p> | <p>Learning time: 31h Theory classes: 10h Laboratory classes: 6h Self study : 15h</p> |
| <p>Description: Local loop Features Local loop model Unbundled local loop Twisted pair access networks. xDSL Types and features Hybrid fiber coaxial HFC Optical fiber access networks. FTTx Networks of the power line. PLC</p> <p>Related activities: Lab: Performance evaluation of networks infrastructures.....(4 weeks) Methodology Use cases measurements Exercise realized individually at the lab.</p> | |

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| Topic 3. Transport networks | Learning time: 30h Theory classes: 14h Self study : 16h |
| <p>Description:</p> <ul style="list-style-type: none">PDH y SDH networksFundamental concepts in transport networksRequirementsTraffic classificationControl mechanismsAdmission control and police control.Leaky Bucket and Token Bucket.Fairness in traffic management for the backbone. <p>Examples: Virtual circuit networks: ATM and MPLS</p> <p>SDN networks</p> <ul style="list-style-type: none">MotivationSDN architecture. Control and data plane separation.Applications: Network configuration, virtualization. | |

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| <p>Topic 4. Local area networks</p> | <p>Learning time: 50h Theory classes: 13h Laboratory classes: 10h Self study : 27h</p> |
| <p>Description:</p> <p>Ethernet:</p> <ul style="list-style-type: none"> Ethernet basics Ethernet physical mediums Ethernet Implementations Switches and Spanning Tree Protocol Flow Control Auto-negotiation VLAN Link aggregation Power over Ethernet <p>Wireless Local Area Networks (WLAN)</p> <ul style="list-style-type: none"> IEEE802.11 standard: 802.11a/b/g/n/ac Physical layer MAC layer and access schemes (PCF and DCF) Quality of service: 802.11e Power management Fairness and performance analysis <p>Related activities:</p> <p>Lab:</p> <p>Ethernet network configuration and Wifi Access Point usage.....(3 weeks)</p> <ul style="list-style-type: none"> Connections and types of devices Measures: Throughput, delay and others. <p>Ethernet network configuration and Wifi connected to the backbone.....(3 weeks)</p> <ul style="list-style-type: none"> The physical medium. Configuration and connection of devices. IPv6 configuration and QoS allocation concerning network topology. Exercise realized individually at the lab. | |
| <p>Evaluation</p> | <p>Learning time: 25h Laboratory classes: 4h Self study : 21h</p> |
| <p>Description:</p> <p>Activities to evaluate the contents of the subject.</p> <p>Related activities:</p> <ul style="list-style-type: none"> Mid-semester evaluation 2 evaluation exercises at the laboratory Exam | |

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Qualification system

Laboratory exams: 30%
Laboratory exercises reports: 10%
First exam: 25%
Final exam: 35%

This subject evaluate the following generic competences:

- Third language (Medium level)
- Experimentality and instruments knowledge (medium level)

Regulations for carrying out activities

Regulations concerning "revaluació" from ETSETB: Only applies to "Final Exam".

Bibliography

Basic:

- Stallings, W. Comunicaciones y redes de computadores. 7a ed. Madrid: Pearson Educación, 2004. ISBN 8420541109.
- Rauschmayer, D.J. ADSL/VDSL principles: a practical and precise study of asymmetric digital subscriber lines and very high speed digital subscriber lines. Indianapolis: Macmillan Technical Publishing, 1999. ISBN 1578700159.
- Ilyas, M; Mouftah, H.T. The handbook of optical communication networks [on line]. CRC Press, 2003 [Consultation: 03/07/2014]. Available on: <<http://lib.mylibrary.com?id=9560>>. ISBN 9780203489642.
- Perahia, E.; Stacey, R. Next generation wireless LANs : throughput, robustness, and reliability in 802.11n, 802ac [on line]. 2a ed. New York: Cambridge University Press, 2013 [Consultation: 03/07/2014]. Available on: <<http://site.ebrary.com/lib/upcatalunya/docDetail.action?docID=10718563>>. ISBN 9781107347793.
- Perros, H.G. Connection-oriented networks: SONET/SDH, ATM, MPLS, and optical networks. Hoboken: John Wiley, 2005. ISBN 0470021632.

Complementary:

- Held, G. Ethernet networks: design, implementation, operation, management. 4th ed. West Sussex: John Wiley & Sons, 2003. ISBN 0470844760.
- Olifer, N.; Olifer, V. Computer networks: principles, technologies and protocols for network design. Chichester: John Wiley, 2006. ISBN 9780470869826.
- Spurgeon, C.E. Ethernet: the definitive guide [on line]. 2nd ed. Sebastopol, CA: O'Reilly, 2014 [Consultation: 19/02/2019]. Available on: <<https://ebookcentral.proquest.com/lib/upcatalunya-ebooks/detail.action?docID=1651722>>. ISBN 9781449361846.
- Chen, W.Y. DSL simulation techniques and standards: development for digital subscriber line systems. Indianapolis: Macmillan, 1998. ISBN 1578700175.