Course guide
270125 - TXC - Computer Network Technology

Last modified: 30/01/2024

Unit in charge:	Barcelona School of Informatics
Teaching unit:	701 - DAC - Department of Computer Architecture.

Degree:	BACHELOR'S DEGREE IN INFORMATICS ENGINEERING (Syllabus 2010). (Optional subject).

Academic year: 2023   **ECTS Credits:** 6.0   **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer:	DAVIDE CAREGLIO
Others:	Primer quadrimestre: JOSE MARIA BARCELÓ ORDINAS - 10 DAVIDE CAREGLIO - 10 Segon quadrimestre: JOSE MARIA BARCELÓ ORDINAS - 10 DAVIDE CAREGLIO - 10

PRIOR SKILLS

Least to read English technical documentation, manuals and standards. Basic knowledge on computer networks. Basic knowledge of operating systems.

REQUIREMENTS

- Pre-Corequisite XC

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CT6.1. To demonstrate knowledge and capacity to manage and maintain computer systems, services and applications.
CT6.4. To demonstrate knowledge and capacity to apply the characteristics, functionalities and structure of the Distributed Systems and Computer and Internet Networks guaranteeing its use and management, as well as the design and implementation of application based on them.
CT7.1. To demonstrate knowledge about metrics of quality and be able to use them.
CT7.3. To determine the factors that affect negatively the security and reliability of a hardware/software system, and minimize its effects.
CTI1.1. To demonstrate understanding the environment of an organization and its needs in the field of the information and communication technologies.
CTI1.2. To select, design, deploy, integrate and manage communication networks and infrastructures in a organization.
CTI2.1. To manage, plan and coordinate the management of the computers infrastructure: hardware, software, networks and communications.
CTI2.3. To demonstrate comprehension, apply and manage the reliability and security of the computer systems (CEI C6).
CTI3.1. To conceive systems, applications and services based on network technologies, taking into account Internet, web, electronic commerce, multimedia, interactive services and ubiquitous computation.
CTI3.3. To design, establish and configure networks and services.

Generical:

G9. PROPER THINKING HABITS: capacity of critical, logical and mathematical reasoning. Capacity to solve problems in her study area. Abstraction capacity: capacity to create and use models that reflect real situations. Capacity to design and perform simple experiments and analyse and interpret its results. Analysis, synthesis and evaluation capacity.

TEACHING METHODOLOGY

The proposed teaching methodology is based on programming centered learning, cooperative learning, and the Virtual Campus.
1. Programming focuses on learning. Activities in the class session: a) Meeting of temporary groups (for physical proximity in class) to share the doubts last week. Following the interaction of students by the teacher indicating the questionable concepts. b) The teacher will explain the concepts that apply to the program. c) Indication of the studio work outside the classroom. Every two weeks there will be an hour session where problems will be solved by reducing the theory class to 1 hour.
2. Cooperative learning. Students exercise their capabilities in cooperative work developing a technical working in group-based (Technical Report)
3. Campus Atenea. Used in developing the subject in the following aspects: treatment group, documentation class, coassesment workshops, document delivery, monitoring of compliance with delivery dates, forum for exchanging opinions, questions and assignments, resolution surveys.

LEARNING OBJECTIVES OF THE SUBJECT

1. Applying international regulation and standardization in computer networking technology
2. Designing systems interconnection networks modeled by TCP / IP
3. Know the security problems in computer networks and be able to find solutions to protect them.
4. Apply and understand the various methods of synchronization levels 1, 2 and 3 of computer networks
5. Identify the applications of TDM multiplexing systems
6. Determine the requirements of the asynchronous transmission of packets over synchronous and asynchronous transmission networks
7. Design of link layer protocols
8. Differentiate the use of several existing broadcast media and calculate bandwidth
9. Calculate the efficiency and transmission capabilities of synchronization systems
10. Calculate the efficiency of packet transmission networks
11. Designing networks with virtual circuits with different types of terminals and Internet access
12. Calculate the parameters of the algorithms for managing access to networks with traffic contract
13. Designing packet networks calculating the routing tables and delays
14. Identify mechanisms for managing network packet traffic and design their applications
15. Identify and analyze the protocols applied to levels 1,2 and 3 in FTTH access networks
16. Calculate the performance and delays in networks, using the management model of quality of service.
17. EExplain the technological elements involved in an mobile networks and interpret access methods
18. Compare features and performance between access networks
19. Calculate efficiency of the PON network with voice / data / image services
20. Designing networks with MPLS and SDN control
21. Programming and sizing the capabilities of cellular networks with different technologies
22. Apply the use of Ethernet and Gigabit standards in the design of backbone networks
23. Designing IP networks with quality of service
24. Understand the design parameters to provide QoS in the Internet.

STUDY LOAD

Type	Hours	Percentage
Hours large group	54,0	36.00
Hours medium group	6,0	4.00
Guided activities	6,0	4.00
Self study	84,0	56.00

Total learning time: 150 h

CONTENTS

Introduction

Description:
Regulation of international computer networks and their involvement in technology. Analysis of the importance of IP networks on network technology and Internet architecture model.

Quality of Service on the Internet

Description:
QoS definition. Services and technologies for QoS on the Internet. IntServ and DiffServ models and protocols. Techniques for traffic shaping and policing. Queue policies.

Wireless Internet Networks access

Description:
Fiber optic network access technologies (FTTH, WDM-PON and EP2P)

Internet core networks

Description:
Technologies for backbone networks. Protocols and services. Optical networks. Control and management. MPLS. SDN/NFV.

Network security

Description:
Firewall. Secure network protocols. Intruder detection systems. Virtual private networks.

ACTIVITIES

Development Topic 1: Introduction

Description:
Attendance for the comprehension of regulations on computer networking technologies.

Specific objectives:
1

Full-or-part-time: 5h
Theory classes: 3h
Self study: 2h

Development Topic 2: QoS in the Internet.

Description:
Class attendance for the acquisition of knowledge about technologies to promote QoS on the Internet.

Specific objectives:
23, 24

Related competencies :
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Full-or-part-time: 27h
Theory classes: 11h
Laboratory classes: 2h
Self study: 14h

Development Topic 3: Wire Internet networks access

Description:
Attendance for the acquisition of knowledge about network access technologies as Fiber optic network access technologies (FTTH, WDM-PON and EP2P). Related regulations and protocols

Specific objectives:
15, 16, 17, 18, 19, 21, 22

Full-or-part-time: 19h
Theory classes: 8h
Laboratory classes: 2h
Self study: 9h

First Test

Description:
Assessment test that includes the resolution of exercises and questions.

Specific objectives:
1, 2, 5, 6, 7, 9, 12, 13, 14, 16, 18, 19, 23, 24

Related competencies :
G9. PROPER THINKING HABITS: capacity of critical, logical and mathematical reasoning. Capacity to solve problems in her study area. Abstraction capacity: capacity to create and use models that reflect real situations. Capacity to design and perform simple experiments and analyse and interpret its results. Analysis, synthesis and evaluation capacity.

Full-or-part-time: 7h 30m
Guided activities: 1h 30m
Self study: 6h

Current research activities in TXC

Description:
Each group will have to select a topic and present a report following a template describing the problem, analyzing the available solutions and, if necessary, proposing new solutions. Before the first control, the assignment of groups is carried out and the development of the work begins based on research articles assigned by the teacher. It will be monitored as a directed activity. Delivery is before the second check. The evaluation is done according to a rubric for the purpose.

Specific objectives:
3, 4, 17, 18, 20, 22, 24

Related competencies :
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Full-or-part-time: 2h
Laboratory classes: 2h

Development Topic 4: Core Networks

Description:
Attendance for the acquisition of knowledge about switching techniques in computer networks.

Specific objectives:
10, 12, 13, 20, 22

Full-or-part-time: 29h
Theory classes: 11h
Laboratory classes: 4h
Self study: 14h

Development of unit 5: Security in networks

Description:
Learning the concepts and objectives associated with this topic.

Specific objectives:
3

Full-or-part-time: 22h
Theory classes: 9h
Laboratory classes: 4h
Self study: 9h

Presentation of the current research in TXC

Description:
Presentation of the report on a current topic on research related to TXC following a template describing the problem, analyzing the available solutions and, where appropriate, proposing new solutions

Specific objectives:
1, 2, 3, 4, 7, 11, 12, 13, 14, 15, 18, 20, 21, 22, 23, 24

Related competencies :
G9. PROPER THINKING HABITS: capacity of critical, logical and mathematical reasoning. Capacity to solve problems in her study area. Abstraction capacity: capacity to create and use models that reflect real situations. Capacity to design and perform simple experiments and analyse and interpret its results. Analysis, synthesis and evaluation capacity.

Full-or-part-time: 18h
Self study: 18h

Review of "Presentation of the current research in TXC"

Description:
Revisió dels informes daltres grups. Cada grup revisarà 3 informes de 3 grups més a través d'Atenea.

Specific objectives:
1, 2, 3, 4, 8, 11, 12, 14, 16, 17, 18, 19, 20, 23, 24

Related competencies :
G9. PROPER THINKING HABITS: capacity of critical, logical and mathematical reasoning. Capacity to solve problems in her study area. Abstraction capacity: capacity to create and use models that reflect real situations. Capacity to design and perform simple experiments and analyse and interpret its results. Analysis, synthesis and evaluation capacity.

Full-or-part-time: 6h
Self study: 6h

Second test

Description:
Assessment test that includes the resolution of exercises and questions.

Specific objectives:
3, 7, 10, 11, 12, 13, 14, 16, 20, 22

Full-or-part-time: 7h 30m
Guided activities: 1h 30m
Self study: 6h

Lab final exam

Description:
Final exam lab around previous sessions

Specific objectives:
3, 11, 15, 20, 22, 24

Related competencies :
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Full-or-part-time: 7h
Guided activities: 1h
Self study: 6h

GRADING SYSTEM

The evaluation of the students and their use of the subject will follow the following criteria:

LAB: Laboratory: 20%. It includes the evaluations of the laboratories based on the evaluation of each session and the final exam. Attendance to laboratory classes is mandatory to be able to evaluate and evaluate yourself.

CO1 and CO2: mod-terms: 65%. The average between the first CO1 mid-term and the second CO2 mid-term will be valued. There is no Final Exam.

TR: Research Work: 15%. The note will be based on a rubric and the quality of the content.

The final grade NF = 0.20*LAB + 0.65*(CO1+CO2)/2+0.15*TR.

The evaluation of the transversal competence G9.3 will be based on the resulting mark between the weighted mark of the controls (60%) and the research work (40%): 0.6* (CO1 + CO2)/2 + 0.4* TR; being : A >=8, B >=6, C >=4, D

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Basic:
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- Stallings, W. Data and computer communications. 10th ed. Boston: Pearson/Prentice Hall, 2014. ISBN 9780133506488.
- Kurose, James F; Ross, Keith W; Mañoso Hierro, Carolina;. Redes de computadoras : un enfoque descendente. Séptima edición. Madrid: Pearson, [2017]. ISBN 9788490355282.

Complementary:
- Davie, B.S.; Farrel, A. MPLS: next steps. Elsevier/Morgan Kaufmann, 2008. ISBN 9780123744005.
- Agustí, R. [et al.]. LTE: nuevas tendencias en comunicaciones móviles. Fundación Vodafone, 2010. ISBN 8493474045.
- Lam, C.F. (ed.). Passive optical networks: principles and practice. Academic, 2007. ISBN 9780080553450.
- Farrel, A.; Bryskin, I. GMPLS: architecture and applications. Elsevier : Morgan Kaufman, 2006. ISBN 9780080456478.

RESOURCES

Hyperlink:
- https://www.gns3.com/- http://www.ieee.org/- https://www.cnmc.es/ambitos-de-actuacion/telecomunicaciones- http://ec.europa.eu/information_society/policy/ecomm/tomorrow/index_en.htm- http://www.itu.int/