Computer networks design and management

Academic Year: (2020 / 2021) **Review date: 03/07/2020 13:06:04**

Department assigned to the subject:

Coordinating teacher: GARCIA RUBIO, CARLOS

Type: Compulsory ECTS Credits : 6.0

Year : 1 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

A content subject similar to the subject "Computer Networks", of the Bachelor in Informatics Engineering of the UC3M.

OBJECTIVES

The students acquire the following competences:

- Ability to project, calculate and design products, processes and facilities in all areas of Computer Engineering (CG1)
- Ability to model, design, define architecture, implement, manage, operate, manage and maintain applications, networks, systems, services and computer content (CE4)
- Ability to understand and know how to apply the operation and organization of the Internet, the technologies and protocols of new generation networks, component models, intermediary software and services (CE5)
- That students have the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous (CB10).

The learning outcomes are:

- A comprehensive knowledge of applicable methods and techniques and their limitations (RA52)
- A deep knowledge and understanding of the principles of their specialty (RA11)
- The competence to apply innovative methods in solving problems (R24)
- The ability to use its technical sense to work with incomplete, complex information and technical uncertainty (RA 33)
- The ability to critically analyze the data and reach conclusions (R43)

DESCRIPTION OF CONTENTS: PROGRAMME

1. Network layer:
- Review. IP packet format. Addressing. NAT. Routing protocols (RIP, OSPF, BGP). ICMP. IGMP. DHCP. IPv6
- Mobile IP. Security at the network layer. IPsec and VPNs

2. Transport layer:
- Review of transport layer. UDP. TCP. Classic variants of TCP (Tahoe, Reno).
- New TCP implementations.
- AQM congestion control.
- DTN.
- Security at transport level. TLS / DTLS.

3. Application layer:
- DNS. Review basic concepts. Advanced DNS. DNSSEC and DDNS. DoH and DoT.
- Remote terminal protocols. Telnet, rlogin and ssh.
- Files transfer protocols. FTP and TFTP.
- Email service. RFC 822, MIME, SMTP, POP and IMAP. ESMTP, Security (STARTTLS, S-MIME), spam (spf,

dkim).
- Web service. HTTP / 1.X. HTTP / 2. IoT protocols: CoAP and MQTT. Performance optimization. Browser APIs and protocols. HTTP/3 and QUIC
- Multimedia communications protocols. RTP, RTCP, RTSP, SIP. Content distribution networks (CDN).
- Network management protocols.

LEARNING ACTIVITIES AND METHODOLOGY

The following learning activities and methodology will be used:

- Theoretical class (AF1):

They will be oriented to the teaching of the specific competences of the subject. They will present the knowledge that students must acquire. To facilitate their development, students will receive the class notes and will have basic reference texts that will allow them to complete and deepen the topics of the subject.

- Practical classes (AF2):

Participatory resolution of exercises and practical cases related to the protocols seen in theory class.

- Laboratory practices (AF4):

Within this subject laboratory practices will be carried out, consisting of a guided statement in which the students will put into practice the concepts studied by configuring various services, using network administrator tools and analyzers to solve in the laboratory various issues that are pose in the statement.

- Personal work and student study (AF7):

Oriented especially to the acquisition of the capacity for self-organization and planning of individual work and the learning process. It may include, among other exercises and complementary readings, as well as personal study by the student.

- Partial and final exams (AF8)

ASSESSMENT SYSTEM

% end-of-term-examination/test:	40
% of continuous assessment (assigments, laboratory, practicals…):	60

Practices and exercises: 60%.

Practices and exercises made in the lab will be evaluated.

Final exam: 40%.

It will consist on a written exam to assess both the theoretical and the practical concepts acquired by the student.

In the extraordinary examination (July) the mark of final exam will have a weight of 100% in the assessment.

a. If the student followed the continual evaluation, the final exam will have the same percent value than in the ordinary examination, and the mark of the continual evaluation will be taken into account.

b. If the student did not follow the continual evaluation, she/he will have the right to be evaluated with the 100% of the mark through the final exam.

c. If the student followed the continual evaluation, she/he will have the right to obtain the higher mark obtained directly 100% from the final exam or taking into account the continual evaluation.

BASIC BIBLIOGRAPHY

- Dordal, Peter L. An Introduction to Computer Networks, edition 1.9.19 http://intronetworks.cs.luc.edu, 2019

- Forouzan, Behrouz A TCP/IP protocol suite, 4th Ed. McGraw-Hill., 2010

- Ilya Grigorik High Performance Browser Networking, O'Reilly (available in https://hpbn.co/), 2013 / 2015

- Kurose, James F, and Keith W. Ross Computer Networking: A Top-Down Approach, 7th Ed. Pearson., 2017

- Ron Aitchison Pro DNS and BIND 10, Apress, 2011

- Ying-Dar Lin, Ren-Hung Computer networks: an open source approach, McGraw-Hill, 2012

ADDITIONAL BIBLIOGRAPHY

- Andrew.S.Tanenbaumi, David J. Wetherall. Computer Networks, 5th Ed. Prentice Hall, 2011

- Kevin R. Fall, W. Richard Stevens TCP/IP Illustrated, Vol. 1: The Protocols, 2nd Ed. Addison-Wesley Professional Computing Series., 2012

- Subir Varma Internet Congestion Control, Morgan Kaufmann, 2015

- W. R. Stevens TCP/IP Illustrated Vol.1 The protocols, Prentice Hall, 1994