Design and operation of communication networks

Academic Year: (2021 / 2022)   **Review date:** 20-05-2021

Department assigned to the subject: Telematic Engineering Department

Coordinating teacher: GARCIA MARTINEZ, ALBERTO

Type: Compulsory ECTS Credits : 6.0

Year : 1 Semester : 1

OBJECTIVES

The student must obtain the following competences and skills:
- Ability to design and dimension transport, diffusion and distribution networks for multimedia contents (Specific Competence 4).
- Ability to model, design, deploy, manage, operate, administrate and maintain networks, services and contents (Specific Competence 6).
- Capacity for planning, decision making and packaging of networks, services and applications considering the quality of service, direct and operation costs, deploying plan, monitoring, safety procedures, scaling and maintenance, as well as manage and ensure quality in the development process (Specific Competence 7).
- Ability to understand and apply the working principles and organization of the Internet, the technologies and protocols related with next generation Internet, component models, intermediate software and services (Specific Competence 8).
- Ability to solve the convergence, interoperability and design of heterogeneous networks with local networks, access and trunk, as well as the integration of telephony, data, television and interactive services (Specific Competence 9).
- Ability to manage telecommunication projects and facilities, complying with current legislation, ensuring the quality of service
The learning outcomes that students achieve in this subject are the following:
- Ability to design configurations for connecting networks, using the BGP protocol, according to the business model of the Internet
- Evaluate the main risks faced by communication protocols and its solutions
- Known the relevance of network management and describe its main functions

The course Advanced Multimedia Services is coordinated with the subject of Design and Operation of Communication Networks (DORC) as follows: DORC addresses the provision and servicing of multimedia content primarily at link and network layers, from the perspective of the organization deploying the networks. On the other hand, in the course of Advanced Multimedia Services aspects of transport level and application-related multimedia service, with an emphasis on end-to-end communication, are covered from the perspective of the user and the developer of multimedia software.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Review of IP
2.   Intradomain routing, BGP
2.1   Internet business model
2.2   Attributes and route selection in BGP
2.3   IBGP
2.4   The BGP protocol
2.5   Traffic engineering in BGP
2.6   Intra-AS traffic engineering: MPLS
2.7   BGP services, BGP VPN
3.   Design of network architectures, redundancy, scalability, residential communication infrastructures
4.   Security in communication protocols
4.1   Introduction to security in communication networks
4.2   Vulnerability analysis in communication protocols
5.   Introduction to network management
5.1   Case of study: requirements for network management in BGP

LEARNING ACTIVITIES AND METHODOLOGY

- Master classes oriented to obtain the expected competences and skills
- Case studies that include different technologies, their integration and inter-networking in order to understand the different architectures and services.
- Group or personal works, exercises and laboratories if necessary. Set of activities to help in the learning of the necessary competences but making emphasis on team work, oral and written skills as well as self-scheduling and complex problems simplification in smaller parts.
- Personal training and own work designed to obtain self-organizing and self-planing skills in relation with student's personal work and learning process.

ASSESSMENT SYSTEM

The evaluation assesses the degree of compliance of the learning objectives from student work. Continuous assessment of their activities will be performed by:
- 1st Partial examination, 35%
- 2nd Partial examination, 20%
- Laboratory, 15%
- Regular final exam will count 30%

In the extraordinary evaluation period, student's grade will be calculated as the greater of:
- The score on the extraordinary evaluation period exam:
- The rating resulting from the continuous assessment (partial examination + security analysis + laboratory practice), with a weight of 75%, and the extraordinary evaluation period, weighting 25%.

% end-of-term-examination:	25
% of continuous assessment (assigments, laboratory, practicals…):	75

BASIC BIBLIOGRAPHY

- Beijnum, Iljitsch van "BGP", O'Reilly, 2010

- Minei, Ina; Lucek , Julian "MPLS-Enabled Applications: Emerging Developments and New Technologies", John Wiley & Sons, 2011
- Uhlig, Steve "From the Traffic Properties to Traffic Engineering in the Internet", VDM Verlag, 2008

- White, Russ "Practical BGP", Addison-Wesley, 2005

ADDITIONAL BIBLIOGRAPHY

- Davie, Bruce S. "MPLS : technology and applications", Morgan Kaufmann.

- De Ghein, Luc "MPLS Fundamentals", Cisco Press.

- Kurose, James F. "Computer networking : a top-down approach featuring the Internet", Addison Wesley.