Universidad Zaragoza

Year : 2020/21

30377 - Network technologies

Syllabus Information

Academic Year: 2020/21
Subject: 30377 - Network technologies
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 581 - Bachelor's Degree in Telecomunications Technology and Services Engineering
ECTS: 6.0
Year: 3
Semester: Second semester
Subject Type: Compulsory
Module: ---

1.General information

1.1.Aims of the course

-Know and correctly locate the techniques and architectures of the most common network technologies in access and transport. Know and can analyze the interconnection methods between these network technologies.

-Know the elements of data network construction, their interconnection, how they are configured and the need to introduce management mechanisms to guarantee proper supervision and control of the main services and applications.

-Configure a network interconnection scenario with different technologies. It is capable of analyzing its behavior by capturing and analyzing data.

-Know the current technological trends in data networks and is able to compare the data transport mechanisms that each proposed technology performs.

1.2.Context and importance of this course in the degree

The course of Network Technologies corresponde to the mention of Telematics and in particular to the subject of Architecture of networks and services. It is proposed that all the students of the Degree take it on an obligatory basis, considering that it is interesting to all Graduates.

1.3.Recommendations to take this course

The course will be taught by teachers from the Telematic Engineering Area of the Department of Electronic and Communications Engineering.

To continue this course normally, it is especially recommended that the student have previously taken the courses of Fundament of Network, Network Interconnection, Network and Service Programming and Network Analysis and Sizing.

On the other hand, students are recommended to actively attend class, which basically consists of: Continuous study of theoretical concepts, Solving the exercises proposed in the problem classes, Interaction with the teacher, And prior preparation and carrying out of laboratory practices in a methodological and rigorous way and during the recommended dates.

2.Learning goals

2.1.Competences

Upon passing the subject, the student will be more competent to:

(CB3) - That students have the ability to collect and interpret relevant data (usually within their area of ??study) to make judgments that include reflection on relevant issues of a social, scientific or ethical nature.

(CB4) - That students can transmit information, ideas, problems and solutions to both a specialized and non-specialized audience

(C1) Conceive, design and develop Engineering projects.

(C2) Plan, budget, organize, direct and control tasks, people and resources.

(C3) Combine general and specialized engineering knowledge to generate innovative and competitive proposals in professional activity.

(C4) Solve problems and make decisions with initiative, creativity and critical reasoning.

(C5) Communicate and transmit knowledge, abilities and skills in Spanish.

(C6) Use the engineering techniques, skills and tools necessary to practice it.

(C9) Manage information, manage and apply the technical specifications and legislation necessary for practice

of Engineering.

(C10) Learn continuously and develop autonomous learning strategies.

(C11) Apply information and communication technologies in Engineering.

(CT1) Build, exploit and manage telecommunication networks, services, processes and applications, understood as systems for collecting, transporting, representing, processing, storing, managing and presenting multimedia information, from the point of view of telematic services.

(CT2) Apply the techniques on which the telematic networks, services and applications are based, such as management, signaling and switching systems, routing and routing, security (cryptographic protocols, tunneling, firewalls, collection mechanisms, authentication and protection content), traffic engineering (graph theory, queuing theory and teletraffic) pricing and reliability and quality of service, both in fixed, mobile, personal, local and long distance environments, with different bandwidths, including telephony and data .

(CT3) Build, operate and manage telematic services using analytical planning, dimensioning and analysis tools.

(CT5) Follow the technological progress of transmission, switching and process to improve telematic networks and services.

(CT6) Design network architectures and telematic services.

2.2.Learning goals

The student, to pass this course, must obtains the following learning goals:

R1. It knows how to differentiate distributed network systems and applications, voice, data, audio, video and interactive and multimedia services.

R2. Knows and correctly locates the techniques and architectures of the most common network technologies in access and transport. Know and can analyze the interconnection methods between these network technologies.

R3. Learn about the elements of building packet-switched transport networks, how they are configured and managed.

R4. Learn about digital transport hierarchies and their topologies. Compares with data transport on other packet-switched networks.

R5. Study the different methods of adjusting speeds in digital transport hierarchies.

R6. She knows how to apply the concepts learned in the commercial equipment of the laboratory, acquiring autonomy at work and making contact with technologies widely used in the business world.

R7. Develops the habit (and especially the skill) of consulting technical documentation from the manufacturers of the devices to be used in the practices. Includes manuals and product specifications.

R8. Understand and use network management tools.

R9. Correctly pose the problem from the proposed statement and identify the options for its resolution. Apply the appropriate resolution method and identify the solution correction

R10. Knows and uses autonomously and correctly the tools, instruments and software applications available in the laboratories and correctly carries out the analysis of the data collected.

R11. Develops the ability to work as a team to carry out the designs and configurations considered, distributing the workload to face complex problems, exchanging information between different groups, in a coordinated and organized manner.

2.3.Importance of learning goals

The understanding of the operation of the technologies of telematic networks, as well as the capacity of analysis of the same is totally essential for the exercise of the competences of a graduate in Engineering of Technologies and Services of Telecommunication.

In addition to the knowledge acquired, the practical training received in the laboratory is of great importance, Regarding both the configuration of equipment and networks, and the ability to analyze from the captures and measurements made on the network. For these reasons, the skills acquired in this subject will be very useful for your

training.

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

The student must demonstrate that they have achieved the expected learning outcomes through the following assessment activities

The student will have a global test in each of the calls established throughout the course. The dates and times of the tests will be determined by the School. The qualification of this test will be obtained as follows:

E1: Final exam (100%). Score from 0 to 10 points. It consists of two parts:

E1A: Exam of theoretical / practical content (50%). It is a written exam. This test will ask questions and / or problems related to the program taught in the subject, both in the classroom sessions and in the laboratory. Therefore, the exam will include both theoretical questions, such as problem solving, or questions on configuration or monitoring aspects, related to the development of practical sessions.

To pass the course, a minimum score of 5 points out of 10 is required in the Theoretical / Practical Contents Exam.

E1B: Final exam of laboratory practices (50%). It should only be done by students who have not passed the continuous assessment during the laboratory sessions period. It consists of solving a practical exercise in the laboratory that will be evaluated orally and through a written questionnaire. This exercise may include contents of all the practices carried out during the teaching period, including aspects specifically related to the management of the tools used in them. In principle, the exam will be carried out in the laboratory on the same day that the theoretical / practical content exam is performed, although, given the individual nature of the evaluation, it may be necessary to schedule these tests on different days, which will be Notified affected students well in advance.

To pass the subject, a minimum score of 5 points out of 10 is required in the final test of laboratory practices.

E2: midterm assessment tests

E2B: Laboratory practices (50%): The performance of laboratory practices is compulsory for all students. The evaluation of the laboratory practices, in the sessions scheduled during the course, will be carried out, for the students who attend all of them, by means of the presentation of studies or previous works when these are necessary for the development of the practice, the report of follow-up of the same and the resolution of a series of questions or activities at the end of the practice (complete unit of one or more sessions).

Obtaining a minimum grade of 7 will exempt the student from taking the final exam of laboratory practices in the laboratory. Students who do not attend the practices must take the final exam of laboratory practices according to the procedure described in E1B.

In summary:

The final grade will be calculated using the following expression:

0.5xE1A + 0.5xEB provided the following three conditions are met:

(0.5xE1A + 0.5xEB)> 5

E1A> 5

EB> 5

where EB corresponds to the note of the laboratory practices obtained either by attending the scheduled sessions and continuous assessment (E2B) or by the final test of laboratory practices (E1B) according to the procedures described above. So:

EB = maximum (E1B, E2B).

If the above conditions are not met, the final grade will include failed.

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The learning process that has been designed for this subject is based on the following:

On-site activities

Type 1 activity (lectures) 20 hours

Type 2 activity (practice sessions) 10 hours

Type 3 activity (laboratory sessions) 30 hours

Type 6 activity (teaching work) 08 hours

Autonomous activities

Type 7 activity (personal study) 78 hours

Final assessment activity

Type 8 activity (written test) 04 hours

4.2.Learning tasks

The program offered to the student to help her/him achieve the expected results includes the following activities ...

Type 1 activity (Lectures): 20 hours

Type 2 activity (practice sessions): 10 hours

In total there are 30 hours of theoretical sessions, problems and practical cases presented in the classroom.

Type 3 activity (laboratory sessions): 30 hours

15 face-to-face laboratory sessions, which aim to develop the techniques and procedures seen in the lectures and practice sessions.

Type 6 activity (teaching work): 8 hours

During the course, practical work will be proposed in which the concepts and skills acquired in the subject will be applied, especially related to the part of network management and supervised by the teacher.

4.3.Syllabus

The contents of lectures and practice sessions are organized in the following thematic units:

Block 0. Introduction. Knowledge review.

-Analog or digital transmission (circuits / packages)

-Transmission rates vs. througput (bps / pps)

-Channels (circuit, virtual circuit, datagram or tunnels)

-Switching (circuits or packages)

Block 1. LAN Switched.

-Ethernet review.

-Switched ethernet.

-Structure of a switch.

-MAC routing.

-MAC switching.

-Multicast.

-Virtual LANs.

-Top level switching.

-SDN (software Defined Network).

Block 2. WAN Switched.

-Review of the Introduction.

-FR: Frame Relay.

-ATM: Asynchronous Transfer Mode.

-MPLS: MultiProtocol Label Switching.

Block 3. Transport technologies.

-Plesiochronous Digital Hierarchy (PDH)

-Synchronous Digital Hierarchy (SDH)

-Wavelength Division Multiplexation (WDM)

Practice 1. Review of technologies and controlled tests using GNS3

-Install and correctly configure the GNS3 tool. Paying special attention to the different GNS3 servers (real, virtual and remote).

-Configure different types of machines (IOS, Qemu, virtualBox, docker, ...) on the real and virtual servers and interconnect them in the same scenario.

-Configure and interconnect GNS3 scenarios located on different computers.

Practice 2. Design and management of switched LAN technologies.

Configure and monitor computers based on switched LAN technology

-Administer and manage LANC's own characteristics such as switching tables or the creation of virtual LANs.

-Manage the equipment, based on the SNMP protocol.

-Build a VLAN scenarios over GNS3.

Practice 3. Design and management of switched WAN technologies.

-Construction of an ATM scenario in GNS3.

-Construction of an ATM and MPLS scenario in GNS3.

-Construction of an SDN over ATM scenario in GNS3.

The proposed type 6 activity will be

Development of an application for managing a LAN concentration element using SNMP.

In this activity, students must develop an application that allows the assignment of ports to segments of a concentration element from a user interface, using the SNMP protocol. The teacher will provide them with the necessary documentation to carry it out, and the student must do the work independently with minimal supervision from the teacher.

4.4.Course planning and calendar

Calendar of face-to-face sessions and presentation of works

The course is taught for 15 weeks with the following distribution of activities:

During the 15 weeks (4 hours / week):

Development of lectures
Developing practice sessions
Development of laboratory practice sessions (2 hours per week)

The course is taught in the second semester of the third year of the degree with a total of 6 ECTS credits. The main activities are organized into lectures, problem solving or practical assumptions in class, and laboratory practices, which require

previous and subsequent work, related to subject content. This distribution has the fundamental objective of facilitating the understanding and assimilation of the concepts that allow covering the competences to be acquired by this subject.

The start and end dates of the course and the specific hours of delivery of the subject as well as the dates of completion of the laboratory practices will be made public according to the times set by the centers.

4.5.Bibliography and recommended resources

[BB: Basic Bibliography / BC: Complementary Bibliography]

[BB] Kurose, James F .. Computer networking: A top-down approach featuring the internet / James F. Kurose, Keith W. Ross. - 7th ed. Boston: Pearson, cop. 2017
[BB] Kurose, James F .. Computer networks. A Downward Approach / James F. Kurose, Keith W. Ross. 7th ed. Pearson, 2017.

URL LISTING:
IETF Request For Comments (RFC): specification documents (miscellaneous) - [http://www.ietf.org/rfc.html]