Advanced communication networks and services

Academic Year: (2020 / 2021)   **Review date: 01-07-2020**

Department assigned to the subject: Telematic Engineering Department

Coordinating teacher: BERNARDOS CANO, CARLOS JESUS

Type: Compulsory ECTS Credits : 6.0

Year : 3 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)
- Communications Networks and Services
- Systems Architecture

OBJECTIVES

The objective of this course is to go deeper and complement the knowledge adquired in the Access Networks and Shared Media, and Communications Networks and Services courses by means of communication protocol development and the configuration of network equipment. This course has been designed with a strong applied component. In order to achieve this objective, the student should gain a number of abilities and knowledge.

Regarding the Program Outcomes (POs), the course covers the following ones:
a) An ability to apply knowledge of mathematics, statistics, science, telecommunication technologies and engineering.
e) An ability to identify, formulate, and solve engineering problems
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Regarding the knowledge (PO j), at the end of the course the student will be able to:
- Know the practical implications of developing network and link layer protocols.
- Know the configuration requirements and go deep into the knowledge of intra-domain routing protocols.

Regarding the abilities, these can be classified in two groups: one of specific abilities and another one of more general abilities or skills.

Regarding the specific abilities, at the end of the course the student will be able to:
- Develop a simple network stack (POs a, e).
- Design and deploy a communications network composed by multiple heterogeneous systems (PO a).
- Configure intra-domain routing protocols in the deployed network (POs a, k).
- Validate the correct operation of the network deployed and configured previously (POs a, k).

Regarding the general abilities or skills, the following ones will be exercised during the course:
- Ability to carry out complex system configurations in a systematic way (POs a,k).
- Ability to work inside a team in order to design and configure the different proposed scenarios, by distributing the work among team-mates to address complex problems (PO k).
- Ability to access technical literature and understand it.
- Ability to access to the required information in order to know the details of a particular configuration (PO k).

DESCRIPTION OF CONTENTS: PROGRAMME

This is a communication networks course, which is based on Internet technologies, and covers the development and configuration of communication protocols, with a strong practical component.

The program is divided in two parts:
1. Development of a RIPv2 daemon over an UDP/IPv4/ARP/Ethernet protocol stack:
  1.1. Review of IPv4 routing
  1.2. Development of an ARP client
  1.3. Development of an IPv4 networking layer
  1.4. Development of an UDP transport layer

1.5. Development of a RIPv2 daemon

2. Configuration of intra-domain routing protocols:
  2.1. Configuration of static routing
  2.2. Configuration of RIP routing
  2.3. Configuration of OSPF routing
  2.4. Configuration of RIP+OSPF routing

LEARNING ACTIVITIES AND METHODOLOGY

The teaching methodology includes:

(1) Theoretical classes at the beginning of each part, that introduce or review the topics related to the program objectives. This knowledge is later consolidated by means of classes in the laboratory (POs a,e,j).

(2) Laboratory classes, where students -- grouped in different teams -- will carry out complex configurations on network nodes and end systems. The correct operation of the developments and applied configurations is also validated, by means of sniffers and network analysis tools (POs a, k).

ASSESSMENT SYSTEM

The evaluation is 100% continuous assessment. The final exam in the regular evaluation phase is a 60% of the final course mark for students that have not followed the continuous assessment work. In the second evaluation, the exam is the 100% of the course mark. The mark of the continuous assessment work is composed of two parts:

- Deployment and configuration of a network scenario using intra-domain routing: 50% of the final mark.
- Development of the network protocol stack: 50% of the final mark.

The evaluation of each of these parts will be conducted by:
- Deliverables and laboratory results: [Evaluates POs a, e, k].
- Exams (during classes) [Evaluates POs a, k].

% end-of-term-examination:	0
% of continuous assessment (assigments, laboratory, practicals…):	100

BASIC BIBLIOGRAPHY

 - B. Kernighan, D. Ritchie The C programming language (2nd Ed.), Prentice-Hall.

 - J. F. Kurose, K. W. Ross Computer Networking, a top-down approach, Pearson - Addison Wesley, 2010

ADDITIONAL BIBLIOGRAPHY

 - W. Richard Stevens TCP-IP illustrated. Vol. 2: The Implementation, Addison-Wesley, 1995