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Computer Networks

Academic Year: (2019 / 2020)   **Review date: 22-07-2019**

Department assigned to the subject: Telematic Engineering Department

Coordinating teacher: VALERA PINTOR, FRANCISCO

Type: Compulsory ECTS Credits : 6.0

Year : 3 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Object Oriented Programming

OBJECTIVES

Through this course, the student will learn basic knowledge about computer networks and telematic applications. In order to achieve this goal, the student will obtain a knowledge base and a set of skills.
In terms of knowledge, the student will learn:
- To understand the layer model use in the design and analysis of communication systems. In addition, the student will learn the layer mode of the Internet.
- Basic knowledge on the link layer, including both point-to-point and shared medium technologies. Also the student will learn about link layer addressing, frame format, and the behaviour of switches, hubs and bridges.
- To know the Internet network layer and to understand the IP layer, including the packet format and IP addressing. To be able to design an IP network. In addition, the student will obtain basic knowledge on routing protocols.
- To know the services offered by traditional transport layers and the mechanisms used to provide those services.
- To understand the role of the application layer in communication networks.

In terms of the skills, we can classify them into specific skill and generic skills.

The specific skills include:
- Know and apply the characteristics, functionalities and structure of the computer networks and Internet and design and implement applications based on them.
- To be able to understand the link layer of a network, both in the point to point case and in the shared medium case.
- Capacity to design, deploy, manage and operate computer networks.
- To understand the types of services offered by TCP and UDP transport layers (including information delimitation, flow control congestion control, etc.)
- To be able to interpret the message exchange of certain application protocols.

In terms of the generic skills, during the course the student will achieve:
- Achieve a global vision of the complex problem of network communications through the layer model.
- An ability to design and conduct experiments, as well as to organize, analyze, and interpret data. This skill will be developed in the lab work as well as in the resolution of study cases. (PO b)
- Soft-skill: an ability to function on multidisciplinary teams, working cooperatively, respectfully, creatively, and responsibly as a member of a team. This skill will be developed though the lab work while configuring and setting the required network topologies as well as in debates and exercises that will performed in groups. (PO d)

DESCRIPTION OF CONTENTS: PROGRAMME

This is a basic course on network communication that presents the basic technologies used in the Internet to enable communication between computers.

The programme has five parts:

1.   Introduction to packet networks.
· Layer model for communication systems
· TCP/IP reference model (Internet).
2.   Application layer in the Internet.

· Study of specific application level protocols.
3.   Transport layer in the Internet.
· Congestion control in packet networks.
· UDP services.
· TCP services.
4.   Network layer in the Internet.
· IP packet format.
· IP addressing.
· IP network design.
· NATs.
· Manual configuration and DHCP based configuration.
5.   Link layer.
· Shared medium technologies.
· Addressing.
· Frame format.
· Link layer devices.

LEARNING ACTIVITIES AND METHODOLOGY

The following activities are performed during the course:

- Theoretical classes. During these classes, a summary of the main concepts are presented. In addition, during these classes discussion will be fostered and the lecturer will clarify the questions the students may have with respect the knowledge they have acquired through the self-learning process. In order to simplify the self-learning process, the students will have a basic text book that contains the bulk of the course programme.
- Exercise classes- During these sessions, the student will solve problems related to the course. The work will be performed in groups of students, fostering the interaction and the team work. (PO d)
- Laboratories. The students will design and configure data networks. This work involves the configuration of communication devices and computers attached to the network. In addition, once the network is working the students will observe the communication protocols covered in the course in action. The students need to prepare the lab session prior attending to the class. (PO b)

ASSESSMENT SYSTEM

The course is scored 70% following the continuous evaluation (70 points) approach and 30% final exam (30 points). It is NOT necessary to get any minimum score in the exam or in any other part of the course to calculate the final global score that must be of at least 50 points. If a student does not follow the continuous evaluation procedure, i.e. he has no points in this procedure, the final exam can be done according to the continuous evaluation rules defined by the University (the maximum score that can be obtained in this exam is stated by the university in this rule).

For the continuous evaluation activities, the score is as follows:
- Theoretical-practical evaluation:
· 2 knowledge tests (PC): 12.5 points each. Every test will last 1.5 hours.
· 4 concept tests (tc): 2.5 points each. Every test will have an estimated duration of 5-10 minutes and may include contents from previous sessions and from the session where the test is evaluated (see schedule).
· 2 proofs of concept (pc): 7.5 points each. They will last 1.5 hours.
- Labs evaluation (PO b and d):
· IP addressing design, PO b, (Ld, it will be done by couples as homework): 2.5 points
· 2 lab practices (routers Lr, wireshark Lw): 17.5 points Lr, (done by couples in the lab, PO d) and 10 Lw, done as homework (personal work, not couples, PO b).
   * 7.5 points of Lr can be obtained in the lab by achieving the different milestones described in the practice ((M1 2 points, M2 5 points, M3-4 3 points)
   * The other 10 points of Lr can be obtained from the exam that will be done to evaluate this part according to the plan included in the scheduling.
   * The wireshark practice Lw will be evaluated with an exam that will be done according to the plan included in the scheduling.

The content of the different evaluation tests will be based on the following table of pi and rqi:
http://www.it.uc3m.es/fvalera/test_contents.pdf. However, the content of this table may be changed depending on the final adjustments made to the scheduling (holidays, etc.) so that the exact content of each evaluation may differ from the table. The text of the different questions and problems may differ from the one included in the reference book.

According to the university rules, the marks obtained in the continuous evaluation part are also valid for the extraordinary call, but are not valid for the following academic year.

The final exam may include any theoretical question or problem from the book related with the course (these questions or problems do not necessarily have to be included into the provided list of pi and rqi in Aula Global). The text of the different questions and problems may differ from the one included in the book. Other problems or questions may also be included even although they do not appear in the book as far as they are related with the content of the course.

The exact score obtained in all the different evaluations will be provided before the final exam, following the University rules. It will also be able to review all the evaluations (continuous evaluation and final exam) in the final review after the final exam. However, the score obtained in the different parts of the continuous evaluation will be progressively published as soon as it is ready.

In order to pass the course it is required to obtain 50 points. The maximum score that can be obtained is 100 points. In the continuous evaluation part 80 points are possible (for a total official score of 70). This has been considered in order to promote a flexible approach to the continuous evaluation concept. For this reason if a student misses any activity of the continuous evaluation set, it will not be possible to repeat it since these extra points have been design so as to cope with these unexpected problems (in any case it will be possible for the students, with a previous notification to the course coordinator, to attend to any other group that still has to do the missing test in order to do it there).

The students may deliver the different problems included in Aula Global before the different sessions programmed to solve them (using the corresponding delivery activity configured in Aula Global) as well as the concept lab practice (Lc), of DNS. These problems and practices will not be evaluated during the course (obviously the students may benefit from asking about them in the different mentoring sessions or problem solving sessions) and will only be considered in case the final mark of the student stays between 4.5 and 5 points, 5.5 and 6 points, 6.5 and 7, 7.5 and 8 points, 8.5 and 9 or over 9. In case most of the problems and practices have been delivered and were properly solved and at least 1 out of 10 points have been obtained in the final exam, it would be considered to upgrade the final score to 5, 6, 7, 8, 9 or Matricula de Honor.

This course specifically supports the Guide for Good Performing for Students written by the university: https://www.uc3m.es/ss/Satellite/Grado/en/TextoMixta/1371214036111/Best_practices_guide.

% end-of-term-examination:	30
% of continuous assessment (assigments, laboratory, practicals…):	70

BASIC BIBLIOGRAPHY
 - KUROSE, JAMES F., Keith W. Ross Computer Networking, a top-down approach. Seventh Edition, Pearson, 2017