Software Networks

Academic Year: (2024 / 2025) **Review date: 17-01-2025**

Department assigned to the subject: Telematic Engineering Department

Coordinating teacher: OLIVA DELGADO, ANTONIO DE LA

Type: Electives ECTS Credits : 3.0

Year : Semester :

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Communications Networks and Services

LEARNING OUTCOMES

CB1: Students have demonstrated possession and understanding of knowledge in an area of study that builds on the foundation of general secondary education, and is usually at a level that, while relying on advanced textbooks, also includes some aspects that involve knowledge from the cutting edge of their field of study
CB2: Students are able to apply their knowledge to their work or vocation in a professional manner and possess the competences usually demonstrated through the development and defence of arguments and problem solving within their field of study.
ETEGITT4: Ability to construct, develop and manage telecommunication networks, services, processes and applications, such as capture, transport, representation, processing, storage, and multimedia information presentation and management systems, from the point of view of telematics services.
ETEGITT5: Capacity to apply techniques on which telematics networks, services and applications are based. These include systems for management, signaling and switching, routing, security (cryptographic protocols, tunneling, firewalls, payment authentication mechanisms, and content protection),traffic engineering(graph theory, queuing theory and tele-traffic), tarification and service reliability and quality, in fixed, mobile, personal, local or long distance environments, with different bandwidths, including by telephone and data.
ETEGITT6: Ability to design network architectures and telematics services.
RA1: Knowledge and understanding of the general fundamentals of engineering, scientific and mathematical principles, as well as those of their branch or specialty, including some knowledge at the forefront of their field.
RA3: Design. Graduates will have the ability to make engineering designs according to their level of knowledge and understanding, working as a team. Design encompasses devices, processes, methods and objects, and specifications that are broader than strictly technical, including social awareness, health and safety, environmental and commercial considerations
RA4: Research. Graduates will be able to use appropriate methods to carry out detailed research and studies of technical aspects, commensurate with their level of knowledge. The research involves bibliographic searches, design and execution of experiments, interpretation of data, selection of the best proposal and computer simulation. May require consultation of databases, standards and security procedures.
RA5: Applications. Graduates will have the ability to apply their knowledge and understanding to solve problems, conduct research, and design engineering devices or processes. These skills include knowledge, use and limitations of materials, computer models, process engineering, equipment, practical work, technical literature and information sources. They must be aware of all the implications of engineering practice: ethical, environmental, commercial and industrial.

OBJECTIVES

This course describes the principles of software networks, namely network function virtualization and software defined networking. To achieve this objective, the student must acquire specific knowledge and capacities:

- Understand the technological and market context triggering the need of network virtualization

technologies.
- Know and understand the principal virtualization technologies, including virtual machines and containers.
- Understand the basics of programmable data planes.
- Know the principal architecture of network function virtualization.
- Implement, deploy and configure in the lab a realistic network service on a virtualization platform.

DESCRIPTION OF CONTENTS: PROGRAMME

The programme is divided into four parts:
FIRST PART (Introduction):
- Presentation and introduction of the course.
- Introduction to Software Networks.
SECOND PART (Virtualization):
- Introduction to virtualization.
- Hypervisors.
- Virtual machines.
- Containers.
- Hardware support to virtualization.
THIRD PART (Network Function Virtualization):
- Introduction and motivation.
- NFV architecture.
- Software architecture.
FOURTH PART (Software defined networks):
- Introduction to SDN.
- SDN architecture and OpenFlow basics.
- OpenFlow and Integration with NFV.

LEARNING ACTIVITIES AND METHODOLOGY

The teaching methodology includes:

(1) Theoretical classes. Students will be provided with the learning objectives to be covered in which lecture and the specific material to prepare it (prior to the actual class). In these classes, the concepts related to the learning objectives are revised and, with the participation of the students, the acquired knowledge will be checked and strengthened interactively (POs a, j).

(2) Laboratory classes in computer rooms, where students will configure network virtualization tools.

ASSESSMENT SYSTEM

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

The evaluation is 100% continuous assessment in the first evaluation, following the existing University regulation in the second evaluation.

The mark of the continuous assessment work is composed of two parts:

- Lab results (based on milestones and/or short reports, there may be additional lab tests): 60%.
- Knowledge tests (during the sessions): 40%.

BASIC BIBLIOGRAPHY

- William Stallings Foundations of Modern Networking: SDN, NFV, QoE, IoT, and Cloud, Addison-Wesley Professional, 2015

ADDITIONAL BIBLIOGRAPHY

- Ken E. Gray and Thomas D. Nadeau Network Function Virtualization, Morgan Kaufmann, 2016

- Ken Gray and Tom Nadeau SDN: Software Defined Networks: An Authoritative Review of Network Programmability Technologies, O'Reilly, 2013