VNIVERSITAT DE VALÈNCIA

Course Guide
34885 Computer network architecture

COURSE DATA

Data Subject	
Code	34885
Name	Computer network architecture
Cycle	Grade
ECTS Credits	6.0
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
1403 - Degree in Telematics Engineering	School of Engineering	2	First term

Subject-matter

Degree	Subject-matter	Character
1403 - Degree in Telematics Engineering	10 - Networks	Obligatory

Coordination

Name	Department
OLANDA RODRIGUEZ, RICARDO	240 - Computer Science

SUMMARY

The subject of computer network architecture is framed within a subject group of computer networks, which are closely related, divided into two subjects and three subjects. This course is part of the basic knowledge acquired in the first quarter in Fundamentals of networks, technologies and delving into more advanced network protocols. In particular, Fundamentals of computer networks with computer networks architecture form a field of 12 credits under the name Network.

It is the second semester of the second course in Engineering degree from Telematics (GIT) and the Electronic Engineering degree in Telecommunications (Gieten) is mandatory, and has a teaching 6 ECTS credits.

The course has been designed with a methodology adapted to the new European Higher Education Area (EHEA), and central aims in student learning. Matter, and in particular subjects, are designed with a joint plan focused on the methodology of Problem Based Learning (PBL). This method enhances student involvement and support its assessment on an ongoing basis, reinforcing and complementing the knowledge acquired in lectures.

Computer network architectures focuses on expanding the knowledge of networks acquired by the students in the subject of fundamentals of computer networks. To this end, a study of networking applications is done. Moreover, networking security are introduced too. To improve the assimilation of theoretical concepts shall be proposed in a theoretical group which will deploy the technologies seen in the theoretical modules

The main overall objectives of the course are:

- Acquire a basic knowledge of advanced networking and related protocols in order to understand network applications that use them.
- Learn to conduct a project that requires the assimilation of theoretical content and the deployment of a multimedia network taking into account technical and economic factors.
- Develop collaborative skills, group work and leadership to carry out a project-oriented work.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

Prior knowledge required is the subject of Computer and Network Fundamentals course in computers. The course is in the first semester of the second course. Therefore assumes that students already have basic knowledge in the field of engineering and have developed skills in solving problems. Also it is expected that students have learned teamwork dynamics and skills. This knowledge will be reinforced throughout the courses in this area with special emphasis on teamwork skills, project-oriented.

OUTCOMES

1403 - Degree in Telematics Engineering

- G3 - Acquisition of the knowledge of the basic and technological subjects that allows students to learn new methods and theories and endows them with the versatility to adapt to new situations.
- G4 - Ability to solve problems with initiative, decision-making and creativity, and to communicate and transmit knowledge, abilities and skills, understanding the ethical and professional responsibility of the activity of a telecommunications technical engineer.
- G5 - Knowledge to carry out measurements, calculations, assessments, evaluations, loss adjustments, studies, reports, task planning, and other analogous work in the specific field of telecommunications.

- G6 - Ability in the handling of specifications, regulations and norms of compulsory compliance.
- R6 - Ability to conceive, deploy, organize and manage telecommunications networks, systems, services and infrastructures in residential (home, urban and digital communities), business and institutional contexts, as well as understanding their economic and social impact.
- R12 - Understand and use the concepts of network architecture, protocols and communications interfaces.
- R13 - Ability to differentiate the concepts of access and transport networks, circuit and packet switching networks, fixed and mobile networks, as well as distributed network systems and applications, voice, data, audio, video, interactive and multimedia services.
- R14 - Understand the interconnection and routing methods of network, as well as the fundamentals of planning, sizing networks according to traffic parameters.

LEARNING OUTCOMES

The student should acquire the following **skills**:

- Ability to access and understand technical literature and the ability to access the information required to know the details of a particular configuration. (G3, G6)
- Design a data network with integration of different technologies with different sizes (local, metropolitan, wide area), using both public and private addressing. (G3, G4, G5, R6, R12, R13, R14)
- Set up the necessary devices (switches and routers) for the operation of a network and know how to administer the minimum services to be deployed. (G3, G4, G5, R6, R12, R13, R14)
- Ability to specify rules to write a specification for the deployment of a network. (G3, G4, G5, G6, R6, R12, R13, R14)
- Discuss the elements of security in a computer network. (G3, G4, G5, R6, R12, R13, R14)
- Design based programs using the libraries network of transportation and sockets. (G3, G4, G5, R6, R12, R13, R14)
- To apply the traffic engineering criteria for deployment of networks with MPLS technologies, QoS and Multicast. (G3, G4, G5, R6, R12, R13, R14)
- Understand the advantages and limitations of different technologies used in current networks. (G3, G4, G5, R6, R12, R13, R14)

The student should acquire the following **social skills**:

- Identify the most important technological applications in the social environment.

Organize the work and implement it in a group.

DESCRIPTION OF CONTENTS

0. Introduction

Review of networking basics
Networking technologies
Important concepts of the OSI reference model

	Face	No face
Theory	4	7
Problems	1	2

1. Transport Protocols

Introduction
Port, process and socket.
Transport level programming
TCP protocol. Flow control and congestion. Data Exchange. Applications
UDP protocol. Data Exchange. Applications

	Face	No face
Theory	7	10
Problems	3	4

2. Application Protocols

Introduction.
Email. SMTP. POP and IMAP protocols. Domain Name Servers. DNS.
Other applications: FTP, Telnet, ssh, HTTP(s), SNMP, NTP
Basic examples of configuration, management and tools.

	Face	No face
Teoría	6	9
Problemas	2	3

3. Network Security

Introduction
Encrypted communications. Methods symmetric (DES, 3DES, AES) and asymmetric (RSA).
Integrity and compendia. Methods SHA, MD5.
Certificates and public cable infrastructure. format X.509.V3
Types of attacks on networks. Classification.
Access lists. Filtering. Firewall and DMZ. Honeypots.
Tunneling technologies: IPsec and VPN.

Face No face
Theory 7 10
Problems 2 3

4. Wifi Network

Introduction
Wifi design, 802.11a, b, g, n, ac
WLAN security

Face No face
Theory 6 9
Problems 2 3

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	30,00	100
Laboratory practices	20,00	100
Classroom practices	10,00	100
Development of group work	15,00	0
Study and independent work	15,00	0
Readings supplementary material	15,00	0
Preparation of evaluation activities	15,00	0
Preparing lectures	15,00	0
Preparation of practical classes and problem	15,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

The training activities are conducted in accordance with the following distribution:
40% of the hours of ECTS credits (1 credit is 25 hours) will go to the following sessions:

- **Theory:**
  The lectures will develop the issues by providing a global and inclusive vision, analyzing in detail the key issues and more complex, encouraging at all times, participation / student. (G3, G4, G5, G6, R6, R12, R13, R14)

- **Practical activities:**
  Complement the theoretical activities in order to apply the basics and expand the knowledge and experience to be acquired in the course of the work proposed (R6, R12, R13, R14). They include the following types of classroom activities:

- **Classes of problems and issues in the classroom:**
  or discussion sessions and problem-solving exercises and previously worked by students
  or Labs
  or oral presentations
  or tutorials scheduled (individualized or group)

- **Evaluation:**
  Making individual evaluation questionnaires in the classroom with the presence of teachers.

60% of the hours of ECTS (25 hours per ECTS) will be devoted to the following non-contact activities:

- **Work in small groups.**
  Realisation, by small groups of students (2-4) of work, issues, problems outside the classroom. This work complements the work and encourages individual ability to integrate into working groups.

- **Work student (independent).**
  Realization (outside the classroom) of monographs, literature search directed, issues and problems as well as the preparation of classes and exams (study). This is done individually and tries to promote self-employment.

It will use the platform of e-learning (virtual classroom) of the University of Valencia in support of communication with students. Through it you will have access to course materials used in class as well as solve problems and exercises.

EVALUATION

Next is the criteria for the evaluation:

Tabla. Criterios y pesos de evaluación

Criteria	Final evaluation	Continous evaluation	Project weight	Evaluation in July
Written exam (at the end, including mid-term)	35% 20% (P)	0% 15% (P)		40%
Lab exam	15%			20%
Project documentation		15%	15%	20%
Project presentation		10%	10%	5%
labs		15%		10%
Continous evaluation		10%		5%
Total	**50%-35%(P)**	**50%-65%(P)**	**25%**	**100%**

*(P): it shows the midterm, with a weight of 15% + 20%., otherwise it has a weigh of 35%

*You must obtain a minimum score of 4 in the written exams of theory and laboratory in orden to pass the course.

The evaluation is during the course and its activities.

There are groups of 3 persons for the projects, the same groups that in the labs. So it will be a good criterion for the evaluation.

When the group activity cannot be taken into account the weights varies as the table shows.

In any case, the evaluation system will be managed by what el sistema de evaluación se regirá por lo establecido en el “Reglament d'Avaluació i Qualificació de la Universitat de València per a Graus i Màsters” (https://webges.uv.es/uvTaeWeb/MuestraInformacionEdictoPublicoFrontAction.do?accion=inicio&idEdictoSeleccionado=5639)

REFERENCES

Basic

- Apuntes de la asignatura

Additional

- Tanenbaum, Andrew S.: Redes de Computadoras, Prentice-Hall
  - Stallings, William: Comunicaciones y Redes de Computadores, Prentice-Hall
  - Kurose, James F.: Redes de Computadores, Prentice Hall