

**COURSE DATA****DATA SUBJECT****Code:** 34678**Name:** Fundamentals of computer networks**Cycle:** Undergraduate Studies**ECTS Credits:** 6**Academic year:** 2025-26**STUDY (S)**

Degree	Center	Acad. year	Period
1400 - Degree in Computer Engineering	Escola Tècnica Superior d'Enginyeria	2	First quarter
1936 - Double Degree Program in Mathematics-Telematics Engineering	Facultat de Ciències Matemàtiques	3	First quarter

**SUBJECT-MATTER**

Degree	Subject-matter	Character
1400 - Degree in Computer Engineering	Operating systems, distributed systems and networks	COMPULSORY
1936 - Double Degree Program in Mathematics-Telematics Engineering	Tercer curso	COMPULSORY

**COORDINATION**

GARCIA PINEDA MIGUEL

**SUMMARY**

The course Fundamentals of Computer Networks is framed within a subject group of networks. This is the most basic course focusing on network fundamentals necessary for subsequent courses that delve into network architecture and planning networks.

The course of 6 credits will correspond to the 1 st semester of the 2 nd year.

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

The overall objectives are to cover in detail the following contents: interconnection models of computers,



infrastructure physical network; layer data link layer, medium access layer; network layer, transport protocols.

## PREVIOUS KNOWLEDGE

### RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

### OTHER REQUIREMENTS

Being a second-year course, it is assumed that students already have basic knowledge in the field of engineering and have developed skills to solve problems. Also it is expected that students have learned teamwork dynamics and skills.

More specifically, it is expected that students have knowledge of binary and hexadecimal encoding, binary arithmetic and fundamentals of electronic circuits, from the matter Computing.

## COMPETENCES / LEARNING OUTCOMES

### 1400 - Degree in Computer Engineering

G1 - Ability to design, write, organise, plan, develop and sign projects in the field of computer engineering aimed at the design, development or exploitation of computer systems, services and applications.

G2 - Ability to lead project activities in the field of information technology, in accordance with both the knowledge and the specific skills acquired in the degree.

G3 - Ability to design, develop, evaluate and ensure the accessibility, ergonomics, usability and security of computer systems, services and applications, and of the information that these manage.

G4 - Ability to define, evaluate and select hardware and software platforms for the development and implementation of computer systems, services and applications, in accordance with both the knowledge and the specific skills acquired in the degree.

G6 - Ability to design and develop computer systems and centralised or distributed computer architectures which integrate hardware, software and networks, in accordance with both the knowledge and the specific skills acquired in the degree.

R11 - Knowledge and application of the features, functionalities and structure of distributed systems, computer networks and Internet, and ability to design and implement applications based on them.

SI3 - Ability to actively participate in the specification, design, implementation and maintenance of information and communication systems.

TI2 - Ability to select, design, implement, integrate, evaluate, build, manage, exploit and maintain hardware, software and network technologies, within adequate cost and quality thresholds.

TI4 - Ability to select, design, implement, integrate and manage communication networks and infrastructures in an organisation.



## DESCRIPTION OF CONTENTS

### 1. Introduction

Interconnection networking models:

- Introduction
- OSI, TCP / IP and hybrid models
- Definition of protocol and PDU
- Basic examples: MAC address, protocol ARP, IP, mask and gateway

Face No face  
Theory 2 3  
Problems 1 1,5

### 2. Physical network modeling

Physical infrastructure of the network:

- Introduction
- Transmission media. Classification and categories
- Characterization of the media. Attenuation. Crosstalk. Band width
- Structured Cabling Standards

Media Access Layer:

- Introduction
- Philosophy of shared access
- CSMA algorithms: CSMA / CD, CSMA / CA
- IEEE 802.3, 802.11
- Switches. Operation.
- Spanning Tree Algorithm and Link Aggregation
- The concept of VLANs
- Trunk interfaces (IEEE 802.1q)

Layer Data link layer:

- Introduction



- Frame Definition
- Overview of link layer protocols
- Study checksum and CRC
- PPP and HDLC

Face No face  
 Theory 14 21  
 Problems 5 7,5

### 3. Logical Network Modeling

Network Layer:

- Introduction
- IP protocol. Headers. IPv4, IPv6
- IP addressing
- VLSM and summarization technique
- Operation of the router. Routing tables
- Fragmentation
- Routing algorithms: distance vector and link state
- Routing protocols internally and externally

Transport Layer:

- Introduction
- Port concept, process
- Basics of TCP and UDP
- Concept of NAT: static, dynamic and extended

Face No face  
 Theory 14 21  
 Problems 4 6

## WORKLOAD

### PRESENCIAL ACTIVITIES

Activity	Hours
Theory	30,00
Laboratory	20,00
Classroom practices	10,00
<b>Total hours</b>	<b>60,00</b>

### NON PRESENCIAL ACTIVITIES



Activity	Hours
Attendance at other activities	0,00
Individual or group project	15,00
Independent study and work	30,00
Preparation of lessons	30,00
Preparation for assessment activities	15,00
Resolution of case studies	0,00
<b>Total hours</b>	<b>90,00</b>

## 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**:

- **Activities 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.
- **Practical activities.** Complementing theoretical activities in order to apply the basics and expand the knowledge and experience to be acquired in the course of the work proposed. They include the following types of classroom activities: Classes of problems and issues in classroom discussion sessions and problem-solving exercises and previously worked by students laboratory practice oral presentations, conferences, tutorials scheduled (individualized or group). Laboratory practices will be mandatory and not retrievable.
- **Evaluation.** Implementation of 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.** Realization, 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.
- **Working staff / student.** Realization (outside the classroom) of monographs, literature search directed, issues and problems as well as the preparation of classes and exams (study). In this task, the Cisco Systems teaching platform will be used, where students will be able to access the content of the subject online. The students will be able to obtain an official certification in the case of completing the work proposed by the teachers using this platform. This is done individually and tries to promote self-employment.

The platform of e-learning (virtual classroom) of the University of Valencia will be used 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.

In addition, the Cisco Systems teaching platform will also be used so that students can take the certification with contents very similar to those seen in the course.



## EVALUATION

The subject will be evaluated as follows:

### 1) Theoretical part and problems (60%)

- Continuous evaluation oriented with Cisco certification (10%) - CONT
- Final exam (40%) - FINAL\*
- Intermediate test of short duration (10%) - PARTIAL\*

\* If PARTIAL is greater than or equal to 7.0 out of 10, the percentage of PARTIAL will be 35% and will eliminate material for the final exam (FINAL will be worth 15%).

### 2) Laboratory part (35%)

- Attendance, preparation and realization of the evaluated practice in the same laboratory (10%) - LAB
- Practice Oriented Assessment with Cisco Certification (10%) - PTSA
- Multiple choice and/or short questions, as well as practical questions (15%) - EXAM-LAB

3) Realization and presentation of works and exercises proposed by the teaching staff (5%) with the following methods:

- Objective test, consisting of one or several exams that will consist of both theoretical-practical questions and problems.
- Assessment of practical activities based on the preparation of papers/reports and/or oral presentations.
- Continuous evaluation of each student, based on assessable activities, the participation and degree of involvement of the students in the teaching-learning process, taking into account regular attendance at the scheduled face-to-face activities and the resolution of recommended questions and problems.

In 1st call, to make the average, it is necessary to obtain a minimum grade of 4 in each of the parts of the CONT, FINAL, EXAM-LAB and PTSA. If the subject is not approved in the 1st call, the grades of those parts that have passed the minimum grade could be saved for the second call. In the event of having to repeat FINAL in the 2nd call, FINAL and PARTIAL (even if the latter is approved) will be replaced by a single exam with a weight of 45% of the final grade and in which a minimum grade of 4 in each of the parts to be able to make the average.

In the 2nd call, in EXAM-LAB it will still be necessary to obtain a minimum grade of 4 to make the average and those parts of CONT that have not obtained the minimum grade of 4 in the 1st call can be recovered.

Attendance, preparation and completion of the practice evaluated in the same laboratory (10% - LAB), the



practical evaluation oriented with Cisco (10% - PTSA) or the completion and presentation of works and exercises proposed by the teaching staff (5%) cannot be recovered in the 2nd call.

Copying or plagiarism of any activity that is part of the evaluation will result in the impossibility of passing the course, and the student will then be subject to the appropriate disciplinary procedures indicated in the ACTION PROTOCOL FOR FRAUDULENT PRACTICES AT THE UNIVERSITY OF VALENCIA ([ACGUV 123/2020](#)).

## REFERENCES

- Apuntes de la asignatura en Aula Virtual
- Tanenbaum, Andrew S.: Redes de Computadoras, Prentice-Hall
- Lazaro Diaz. CCNA Routing and Switching 200-125 Certification Guide. Packt Publishing, 2018. Print.
- Stallings, William: Comunicaciones y Redes de Computadores, Prentice-Hall
- Kurose, James F.: Redes de Computadores, Prentice Hall