

1. BASIC DATA

Course	Networking Fundamentals
Degree program	Bachelor's Degree in Computer Engineering
School	School of Architecture, Engineering and Design
Year	First
ECTS	6
Credit type	Core
Language(s)	Spanish/English
Delivery mode	On-campus / Online
Semester	S1
Academic year	2024/2025
Coordinating professor	Silvia Abad

2. PRESENTATION

Networking Fundamentals is the first course of the Networking and Communications Technologies subject in the degree, preceding the Computer Networks course taught in the third year. The combination of the two courses provides the student the necessary knowledge to play the role of Network Administrator and to understand the fundamentals of computer networks and the Internet, thus being able to design and implement applications based on them.

3. COMPETENCES AND LEARNING OUTCOMES

Basic skills (CB, by the acronym in Spanish):

- CB4: Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences.
- CB5: Students have developed the learning skills necessary to undertake further study in a much more independent manner.

General skills (CG, by the Spanish acronym):

- CG3: Ability to design, develop, assess and ensure the accessibility, ergonomics, usability and security of systems, services and computer applications, as well as the information they manage.
- CG6: Ability to conceive and develop centralised or distributed computer systems or architectures, integrating hardware, software and networks.

Transversal skills (CT, by the acronym in Spanish):

- CT1: Independent Learning: Ability to choose the most effective strategies, tools and opportunities for independent learning and implementation of what has been learnt.
- CT5: Practical application. Ability to put knowledge into practice, using the skills acquired through the study of mock situations based faithfully on real life issues in the relevant profession.

- CT16: Decision-making: Ability to choose between different options or methods to effectively solve varied situations or problems.
- CT17: Teamwork: Ability to integrate and collaborate actively with other people, departments and/or organisations in order to reach common goals.

Specific skills (CE, by the acronym in Spanish):

- CE5: Knowledge of the structure, organisation, operation and interconnection of computer systems, the fundamentals of their programming, and how they are used to solve engineering problems.
- CE17: Knowledge and application of the characteristics, functionalities and structure of Distributed Systems, Computer Networks and the Internet, and to design and implement applications based on them.

Learning outcomes (RA, by the acronym in Spanish):

- RA1: Communicate through data networks layers using the network reference models.
- RA2: Analyse the basic operations and characteristics of protocols and services of the network and transport layers, making progress on the analysis of the IP protocol.
- RA3: Perform basic configuration and verification of network level devices.
- RA4: Explain the fundamentals of routing algorithms and identify the differences between them.

The following table shows the relationship between the competencies developed during the course and the learning outcomes pursued:

Skills	Learning outcomes
CB4, CG6, CT5, CT16, CE17	RA1: Communicate through data networks layers using the network reference models.
CB5, CG3, CT1, CT16, CT17, CE5	RA2: Analyse the basic operations and characteristics of protocols and services of the network and transport layers, making progress on the analysis of the IP protocol.
CB5, CG3, CT1, CT5, CT17, CE5	RA3: Perform basic configuration and verification of network level devices.
CB4, CG3, CG6, CT1, CT5, CT16, CE17	RA4: Explain the fundamentals of routing algorithms and identify the differences between them.

4. CONTENT

1. Networking software and reference models.
 - 1.1. Networks today
 - 1.2. Basic configuration of switches and terminals
 - 1.3. Protocols and models
2. Layer models. Physical and link layers
 - 2.1. Physical layer
 - 2.2. Data Link Layer
 - 2.3. Ethernet Switching
3. Layer models. Network layer
 - 3.1. Network layer
 - 3.2. Basic configuration of routers
 - 3.3. IPv4 Address Assignment
 - 3.4. IPv6 Address Assignment
 - 3.5. ICMP

4. Routing concepts
 - 4.1 Routing
 - 4.2 Static IP Routes.
 - 4.3 FHRP concepts
5. Layer models. Transport and application level.
 - 5.1. Transport layer
 - 5.2. NAT
 - 5.3 Application layer
 - 5.4. DHCP
 - 5.5 SLAAC and DHCPv6

5. TEACHING-LEARNING METHODOLOGIES

The types of teaching/learning methods are as follows:

- Survey on aims and interests. This survey is used to establish the aims of the subject and gather the student's interests on the subject. We will then make reference to it throughout the year for the students to evaluate the achievement of the aims and interests. In the online delivery mode, an initial questionnaire will be carried out with the same objective. Throughout the year, reference will be made to this survey, and a final reflective questionnaire will be carried out for the students to check their learning progress of the subject.
- Lectures, subjects of study and seminars The "lectures" taught in the on-campus delivery mode are called subjects of study and seminars in the online delivery mode, and are conducted through readings on the topic, technical notes and webinars (which are recorded for students to access). In addition, the students will be given a motivating introduction to each subject area, with multimedia presentations that look at specific topics of the subject, finally followed by forums.
- Laboratory work: while the laboratories described in section 7 will mainly be used in the on-campus delivery mode, the online delivery mode will use the virtual desktop infrastructure, with the different methods and use cases explained in detail in section 7.
 - a) Group investigation (jigsaw) and/or
 - b) group problem-solving. This learning method will be used for the development of both declarative and procedural knowledge.

In method type a), a different topic will be assigned to each group to be investigated. Later, new groups will be formed with students who have all studied a different topic, and these new groups will be proposed comprehension and problem-solving activities. In method type b), a series of short questions and problems will be proposed to be solved in groups. To develop these methods, students have different synchronous and asynchronous tools at their disposal in the online delivery mode, such as forums and group work chats which are only accessible to members of the group, as well as web conferences.

- Designs, understood as practical proposals for solving specific problems (unlike the study of practical cases, it is not a question of delving deeper into the analysis and the real problems. Instead, it is based on this knowledge, and the aim is to provide new solutions in accordance with engineering standards). These learning methods will be used for the development of procedural knowledge. They will be used in all delivery modes and help to develop creative potential and technical skills in the field of engineering. To carry out these methods in e-learning, prepared teaching materials such as study topics, learning resources and individual and group activities are available on the Campus Virtual.
- Simulation. These will be used for the development of conditional knowledge. It is mainly used to develop practical content in the online delivery mode, however, it is also applicable in the classroom for the on-campus delivery mode.
- Practical case studies. These will be used for the development of conditional knowledge. In the online delivery mode, case studies will be used to develop the practical contents of the subject through forums and seminars. This method is also applicable in the classroom for the on-campus modality.

- Fieldwork, conferences, visits to companies and institutions. These will be used for the development of conditional knowledge. In the on-campus delivery mode, all learning methods may be used, while only conferences can be used in the online delivery mode, as they will be available for remote access in real time (via streaming technologies) or recorded and broadcast afterwards.

6. LEARNING ACTIVITIES

The types of learning activities, plus the amount of time spent on each activity, are as follows:

Learning activity	Number of hours
1 Lectures/ Master classes	50
2 Integrative group work, consisting of participation in debates and seminars, and group implementation of integrative application activities, mainly in the classroom.	25
3 Self-study	50
4 Tutorials, academic monitoring and assessment	25
TOTAL	150

7. ASSESSMENT

The assessment systems, plus their weighting in the final grade for the subject area, are as follows

Assessment system	Weight
1 Exams and tests	30%
2 Preparation of papers, reports or design reports	30%
3 Alternative evaluation techniques such as mind maps, diary, debate, portfolios, peer evaluation etc.	25%
4 Field experiences, conferences, visits to companies and institutions will be evaluated on the basis of interventions in a discussion forum. The punctuality of the student in the delivery of their evaluation activities will be valued, whatever the teaching-learning modality.	0%
6 For the evaluation of the basic and general competences corresponding to the subject, exercises, problems, cases will be used Practical, designs, simulations and research. The evaluation of these competences will be carried out explicitly, as an evaluation activity separate from the previous ones.	15%

On the Campus Virtual, when you open the subject area, you will find all the details of your assessable tasks and the deadlines and assessment procedures for each task.

7.1. Ordinary exam period

To pass the course in the ordinary exam period you must obtain a grade greater than or equal to 5.0 out of 10.0 in the final grade (weighted average of all assessment items as per table above). In any case, it will also be compulsory to have a grade greater than or equal to 5.0 in each of the two partial exams.

In addition, you need to attend at least 50% of the classes to pass the course in this exam period.

The course will be divided into two blocks, which will be assessed independently: a first block that will be assessed in the middle of the course with a first mid-term exam, and a second block that will be assessed at the end of the course. If the first mid-term exam is not passed, there will be a new attempt at the end, which will be taken along with the second block exam.

Both block exams need to score >5 to pass the course in the ordinary exam period.

7.2. Extraordinary exam period (resits)

To pass the course in the extraordinary exam period you must obtain a grade greater than or equal to 5.0 out of 10.0 in the final grade (weighted average of all assessment items as per table above). Activity type and weights will be the same as those described for the ordinary exam period. In any case, it will also be compulsory to have a grade greater than or equal to 5.0 in the final exam.

The final exam on the extraordinary period **will cover the full course content**: if only one of the block exams was passed during the ordinary period, this grade will be disregarded. The grade for all other assessment activities that might have been passed during the ordinary period will be kept.

In this exam period, the student will also be allowed to re-submit all other activities (labs, simulations and final design) that had not been passed.

8. TIMELINE

This section indicates the timeline with delivery dates of assessment activities:

Assessment activities	Date
Virtual labs (Packet Tracer simulations)	After each module
Physical labs	After module 2 After module 3 After module 5
Quick tests	After each module
Network Troubleshooting simulations	After module 3 After module 4 After module 5
Exams	After module 3 After module 5
Final network troubleshooting exam	After module 5

This timeline may be subject to changes for logistical reasons relating to the activities. The student will be informed of any changes in due time and course.

9. BIBLIOGRAPHY

The recommended bibliography is indicated below:

- Theoretical-practical material of the courses CCNA1 – Introduction to Networks and CCNA2- Switching, routing and Wireless essentials. These contents will be available to students through the Netacad online platform.

Additional recommended bibliography:

- Tanenbaum, Andrew S., AU - Wetherall, David J., Computer networks (2011) Boston Pearson Prentice Hall
- Kurose, James F, Ross, Keith W. "Computer Networking: A Top-down Approach" 2013 Harlow (England) Pearson Education
- Sequeira, Anthony "Interconnecting Cisco Network devices: Foundation learning guide Certification self-study series" (2013) Indianapolis, Cisco Press

10. DIVERSITY AWARENESS UNIT

From the Educational Guidance and Diversity Unit we offer support to our students throughout their university life to help them reach their academic achievements. Other main actions are the students inclusions with specific educational needs, universal accessibility on the different campuses of the university and equal opportunities. From this unit we offer to our students:

1. Accompaniment and followup by means of counselling and personalized plans for students who need to improve their academic performance.
2. In terms of attention to diversity, non-significant curricular adjustments are made in terms of methodology and assessment for those students with specific educational needs, pursuing an equal opportunities for all students.
3. We offer students different extracurricular resources to develop different competences that will encourage their personal and professional development.
4. Vocational guidance through the provision of tools and counselling to students with vocational doubts or who believe they have made a mistake in their choice of degree.

Students in need of educational support can write to us at:
orientacioneducativa@universidadeuropea.es

11. ONLINE SURVEYS

Your opinion matters!

The Universidad Europea encourages you to participate in several surveys which help identify the strengths and areas we need to improve regarding professors, degree programs and the teaching-learning process.

The surveys will be made available in the "surveys" section in virtual campus or via e-mail.

Your assessment is necessary for us to improve.

Thank you very much for your participation.