1. OVERVIEW

Subject area	Computer Networks
Degree	Bachelor's Degree in Computer Engineering
School/Faculty	School of Architecture, Engineering and Design
Year	Third
ECTS	6
Type	Compulsory
Language(s)	Spanish
Delivery mode	On campus / Online
Semester	Second
Year	2022-2023
Coordinating professor	José Javier Ruiz Cobo

2. INTRODUCTION

Computer Networks is a compulsory subject within the Bachelor's Degree in Computer Engineering, taught in the third year. It is worth 6 ECTS credits, like the rest of the compulsory subjects in the degree programme.
This subject will cover the concepts related to computer networks that are necessary to develop a professional career in profiles, such as systems and networks engineer, director or operations manager, networks and communications manager, systems and networks consultor, systems and networks technician and, indirectly, any IT profession, since they all require basic knowledge on the communication of processes and devices.

3. SKILLS 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 their acronym in Spanish):

- 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. Apply the features, functionalities and structure of VLANs, both static and dynamic routing, dynamic address allocation and security.
- RA2. Construct network topologies including the selection of appropriate intermediate devices and cabling, the configuration of devices to implement VLANs, both static and dynamic routing, dynamic address assignment, and the testing necessary to verify their operation.
- RA3. Examine how current routing algorithms operate.
- RA4. Use the procedures and basic technologies that implement the security of a system.
- RA5. Evaluate the importance of implementing processes that maintain the security of systems.

The following table shows how the skills developed in the subject area match up with the intended learning outcomes:

Skills	Learning outcomes
CB4, CG3, CT1, CT5, CT17, CE5,	RA1. Apply the features, functionalities and structure of VLANs, both static and dynamic routing, dynamic address allocation and security.
CB5, CG6, CT1, CT5, CT17, CE5, CE17	RA2. Construct network topologies including the selection of appropriate intermediate devices and cabling, the configuration of devices to implement VLANs, both static and dynamic routing, dynamic address assignment, and the testing necessary to verify their operation.
CB5, CG6, CT1, CT16, CT17, CE5	RA3. Examine how current routing algorithms operate.
CB5, CG3, CT1, CT5, CT17, CE5, CE17	RA4. Use the procedures and basic technologies that implement the security of a system.
CB4, CG3, CT1, CT16, CT17, CE5,	RA5. Evaluate the importance of implementing processes that maintain the security of systems.

4. CONTENTS

1. Foundations of Networks
1.1. General overview of computer networks
1.2. Ethernet switching

1.3. Subnetting
1.4. Routing

2. Introduction to VLANs
2.1. Introduction and implementation of VLAN
2.2. Routing between VLAN
2.3. VLAN implementation case study
2.4. Spanning Tree Protocol

3. Static routing
3.1. Theoretic foundations of static routing
3.2. Static routing case study solved
3.3. Routing table analysis

4. Dynamic routing algorithms
4.1. Introduction to dynamic routing
4.2. Distance vector routing
4.3. Introduction to link state routing

5. OSPF
5.1. EE routing protocols: OSPF
5.2. OSPF implementation in CISCO routers case study
5.3. OSPFv3
5.4. OSPFv3 case study

6. Other basic network configurations
6.1. Foundations of network security
6.2. Network level security (ACLs)
6.3. Dynamic address allocation in IPv4 and IPv6
6.4. Concepts of VPN and IPSec
6.5. Address translation: NAT
6.6. Concepts of wireless networks

5. TEACHING/LEARNING METHODS

The types of teaching/learning methods are as follows:

1. 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.

2. 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.

3. 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.

4.a) Group research (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.

7.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.

8. 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:

On campus:

Learning activity (AF, by the acronym in Spanish)	Number of hours
1 Lectures, reading on main topics and complementary materials, implementation of activities carried out independently and collectively	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 Independent working	50
4 Tutorials, academic monitoring and assessment, both in the classroom and on the Campus Virtual.	25

Online:

Learning activity (AF, by the acronym in Spanish)	Number of hours
3 Independent working	50
6 Independent reading on complementary topics and materials and implementation of activities carried out independently. Subsequently, asynchronous group discussion on the Campus Virtual forum, and online seminars with the synchronous e-learning tools on the Campus Virtual.	50
7 Integrative group work, consisting of participation in debates and seminars, and group implementation of integrative application activities.	25

8 Tutorials, academic monitoring and assessment through the Campus Virtual. Some assessment tests (e.g. exams) will be carried out on-campus when necessary.	25

7.EVALUACIÓN

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

On campus:

Assessment system	Weighting
1 Exams and tests	30%
2 Development of articles, reports or design briefs	30%
3 Alternative assessment methods with mind maps, diaries, debates, portfolios, peer assessment, etc.	25%
4 Fieldwork, conferences, visits to companies and institutes will be assessed based on the students' participation in a discussion forum. The students' punctuality in submitting assessment activities will be valued, regardless of the delivery mode.	0%
6 For the assessment of the basic and general skills corresponding to the subject, exercises, problems, case studies, designs, simulations and research will be used. These skills will be explicitly assessed with an assessment activity separate from the previous ones.	15%

Online:

Assessment system	Weighting
8) Knowledge tests, exams, test. These will be used for the assessment of declarative knowledge. For the online format, there will be on-campus knowledge tests, which may be oral and/or written.	60%
9 Development of articles, reports or design briefs. These will be used for the assessment of declarative and procedural knowledge. Although the activities are to be carried out in groups, the students will always deliver them Individually. Therefore, each student can explain his/her own contribution to the group, as well as reflect the scope of his/her individual work, or expand on the results obtained in the group work.	20%
10 Alternative assessment methods with mind maps, diaries, debates, portfolios, peer assessment, etc... These systems will be used to assess conditional knowledge, so that the assessment activity itself will be a training activity to exchange conclusions and recap on what has been learnt.	10%
11 Conferences will be evaluated based on the students' participation in a discussion forum.	0%

12 For the assessment of the basic and general skills corresponding to the subject, exercises, problems, case studies, designs, simulations and research will be used with their corresponding defence in an oral or written test. For this delivery mode, the defence will be carried out on-campus. These skills will be explicitly assessed with an assessment activity separate from the previous ones.	10%

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 subject area in the ordinary exam period, you will need a final grade of at least 5.0 out of 10.0 (weighted average) for the subject area.
In any case, it is necessary that you achieve a grade of at least 4.0 in the final exam, so that it can be averaged with the rest of the tasks.

7.2. Extraordinary exam period (resits)

To pass the subject area in the ordinary exam period, you will need a final grade of at least 5.0 out of 10.0 (weighted average) for the subject area.
In any case, it is necessary that you achieve a grade of at least 4.0 in the final exam, so that it can be averaged with the rest of the tasks.
Activities not passed in the ordinary exam period, or those not submitted, must be submitted after receiving the relevant corrections and feedback from the lecturer.

8. TIMELINE

The timeline with submission dates for the assessable tasks in this subject area will be indicated in this section:

Assessable tasks	Date
A1. Continuous recap tests of each unit	At the end of each unit
A2. Fundamental networking simulations	At the end of unit 1
A3. VLAN simulations	At the end of unit 2
A4. Static routing simulations	At the end of unit 3
A5. OSPE dynamic routing simulations	At the end of unit 5
A6. Simulations of basic networking configurations	At the end of unit 6

On campus:
The timeline will be published in detail on the Campus Virtual in a specific section

Online:
The timeline will be published in detail on the Campus Virtual in a specific section
The timelines may be subject to change for logistical reasons related to the activities. Students will be informed of any changes in due time and course.

9. BIBLIOGRAPHY

Student are recommended the following bibliography available in the CRAI Dulce Chacón library:

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10. DIVERSITY AWARENESS UNIT

Students with special educational needs:

To ensure equal opportunities, curricular adaptations or adjustments for students with special educational needs will be outlined by the Diversity Awareness Unit (UAD, Spanish acronym).

As an essential requirement, students with special educational needs must obtain a report about the curricular adaptations/adjustments from the Diversity Awareness Unit by contacting unidad.diversidad@universidadeuropea.es at the beginning of each semester.

11. STUDENT SATISFACTION SURVEYS

Your opinion matters!

Universidad Europea encourages you to complete our satisfaction surveys to identify strengths and areas for improvement for staff, degrees and the learning process.

These surveys will be available in the survey area of your campus virtual or by email.

Your opinion is essential to improve the quality of the degree.

Many thanks for taking part.