Network Infrastructure and Technology

Code: 102751
ECTS Credits: 6

2024/2025

Degree	Type	Year
2502441 Computer Engineering	OB	3
2502441 Computer Engineering	OT	4

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Teachers

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Teaching groups languages

You can view this information at the end of this document.

Prerequisites

Students are assumed to have taken the subject of Networks (102746) in year two.

Objectives and Contextualisation

This course deals with the different types of computer networks in existence today. After classifying these, we specify their components and the standards they comply with, and we analyse their functioning.

On the one hand, students are expected to gain an overall insight into the concepts related to the computer networks in current use, for communication in both local environments and at a distance, and for both wired and wireless systems, to be able to place them within a hierarchical protocol model, and to understand the basic mechanisms of functioning and management. On the other, students must be able to design networks, choosing the best technologies and configurations for each case, simulate these and use tools to keep them working properly and detect malfunctions.

Competences

Computer Engineering

- Acquire thinking habits.

- Capacity to design, develop, evaluate and ensure the accessibility, ergonomics, usability and security of computer systems, services and applications, as well as of the information that they manage.
- Communication.
- Have the capacity to define, evaluate and select hardware and software platforms for the development and execution of computer systems, services and applications.
- Have the capacity to select, design, deploy, integrate, evaluate, build, manage, exploit and maintain hardware, software and network technologies within the suitable parameters of cost and quality.

Learning Outcomes

1. Be able to configure and exploit the possibilities of different types of telematic network.
2. Communicate efficiently, orally or in writing, knowledge, results and skills, both in the professional environment and before non-expert audiences.
3. Demonstrate a high capacity for abstraction.
4. Design and evaluate an integrated information technologies and communications.
5. Know and understand the protocols and equipment in major architectures and communications networks .
6. Know the principles of the management, exploitation and maintenance of information and communication technologies.
7. Use effIciently ICT communication and transmission of ideas and results.
8. know the information technology and communication apply it to meet business needs.

Content

Topic 1. Overview of computer networks

- Functions
- Advantages and disadvantages
- Components
- Classification
- Network architecture - Protocol hierarchy

Topic 2. Management of networks

- Introduction and functions
- Functional areas and management scope
- Models of integrated management
- Management platforms and tools
- QoS and SLA

Topic 3. Data communication

- Data and signals
- Digital transmission
- Analogue transmission
- Use of bandwidth
- Transmission media

Topic 4. Local Area Networs

- Fundamental principles
- Ethernet (IEEE 802.3)
- Interconnection
- Virtual Local Area Network (VLAN)
- Wireless Local Area Network (IEEE 821.11 WLAN)
- Personal Area Network (PAN)

- Datacenters

Topic 5. Wide Area Network

- Fundamental principles
- Classical switched networks
- Frame Relay and ATM
- WAN connection technologies and methods
- SDN and SD-WAN

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Exercises classes	12	0.48	6, 5, 8, 3, 1
Mandatory laboratory classes	12	0.48	6, 8, 4, 1
Theory classes	26	1.04	6, 5, 8, 4
Type: Supervised			
Supervised coursework proposed in class	10	0.4	5, 3, 4, 1
Writing an integrative paper on the subject area	18	0.72	2, 5, 8, 3, 4, 7
Type: Autonomous			
Preparation and self-directed study for mandatory laboratory classes	26	1.04	6, 8, 4, 1
Preparation and self-directed study for practical sessions	42	1.68	6, 5, 8, 4

The teaching methodology is oriented towards continuous learning. Activities conducted throughout the year:

- Theory and exercises classes, in which the lecturer provides information on course content and on strategies for learning, expanding and organising it. Students are encouraged to get actively involved. Their learning is monitored through individual and/or group achievement tests and activities.

- Mandatory laboratory classes, in which students work in pairs on the tasks assigned to them. Lecturers document and schedule these sessions and the students must prepare for them beforehand. Laboratory sessions must further skills acquisition within the subject and help in acquiring certain transferable competences. Throughout the sessions, tools are used to design, analyse and manage different types of networks. After each session, a report must be submitted, whose content is specified in the instructions. Attendance at these sessions is compulsory for all members of the group, within the assigned practicals timetable.

- An integrative paper, in which the students (in groups of four, with guidance from the lecturer) analyse and evaluate a real network in a company or institution. The students prepare a set of questions to be put to the head of the organisation's network in an interview. Based on the visit to the organisation's premises and the interview, they then draw up a general map of the network and identify the different elements that make it up, the technologies used, the standards followed, the management tools used and the failover systems in place. Finally they make an appraisal, detailing the strengths and weaknesses detected, and put forward their ideas for improvements. A written report must be submitted, together with a poster that highlights the main points..

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
1. Class activities (or, optionally, an additional test if less than 75% of activities are attended)	20% - There is no minimum mark	0	0	6, 5, 8, 3, 4
2. Achievement tests (or resits)	40% - The minimum score is 4.5 out of 10	4	0.16	6, 5, 8, 4, 1
3. Monitoring of laboratory sessions with the possibility of a final confirmatory exam	30% - The minimum score is 4.5 out of 10	0	0	4, 1
4. Integrative paper	10% - The minimum score is 4.5 out of 10	0	0	2, 6, 5, 8, 3, 4, 7

Assessment criteria:

Assessment is continuous and formative, based on classwork and a written paper, in which students display what they have learned. We value work that is steady, collaborative and of high quality on the course. We assess knowledge and skills acquisition through performance on the activities, coursework content, reports on laboratory, and tests.

Activities and instruments used in assessment

In-class and out-of-class activities: These take place occasionally in the sessions on theory and problems, or as work to be done outside class and handed in in the next session: self-assessment tests, exercises, case studies, etc. They are classed as non-compulsory activities.

Laboratory: Attendance is compulsory at laboratory sessions, for which a final report is also written. The manuals include the basic topics to be covered. Students perform tasks designed to teach content and skills that they have already come across in theory classes, or which are completely new. It is considered just as important to work through the practical in its entirety as to understand and learn its content. The specific details of how the practicals are organised and monitored (groups, scheduling, weighting, etc.) can be downloaded from the teaching space in the Campus Virtual intranet. Students who are considered not to have demonstrated successful completion of the laboratory sessions may be required to take a confirmatory test based on these.

Achievement tests: These are individual written tests to show that the student has acquired the content and competences taught on the course. One part of the test is taken halfway through the semester and the other at the end.

Integrative paper: This is a compulsory activity. Instructions on format, content and layout are given in a manual available in the Campus Virtual teaching space. Students have to submit a report and a poster that highlights the main points. They are expected to show they have learnt the course content and that of other courses related to it. They are also assessed on how well they communicate their results and on how efficiently they have used ICT.

Final grade:

The final course grade is based on the following:

- The achievement test has a weighting of 40%. This is divided into two partial tests, each accounting for half of the marks available. The minimum score for each of these tests is 4.5 out of 10. Students who fail to reach 4.5 on one of them may pass it by taking the final resit examination scheduled by the School.
- Class activities have a weighting of 20%. Students whose attendance on these activities is below 75% may be assessed on them, if they wish, by taking an additional test on the same day as the final resit examination.
- The laboratory have a weighting of 30%, calculated from the weighted average of the marks for each practical, provided that the student has shown a sufficient level of achievement in the assessment sessions or, if not, has passed the corresponding confirmatory test. To pass this part all final reports must be handed in and only one of these may be given a mark below 4. The minimum pass mark for the practicals is 4.5 out of 10.
- The integrative paper has a weighting of 10%. The minimum pass mark for this part is 4 out of 10.

For every assessment activity, students are given a place, date and time at which they can review the activity with the lecturer. At this point they can lodge an appeal against the mark awarded for the activity, which will be evaluated by the teaching staff responsible for the course. Students who do not attend this review may not review the activity at another time.

Reassessment:

- Students who obtain a mark below 4.5 in any of the partial achievement tests may resit the test at the end of the semester.
- Laboratory assignments cannot be reassessed.
- Students whose attendance on the scheduled activities is below 75% may be assessed on them, if they wish, by taking an additional test on the same day as the final resit examination.
- Students who obtain a mark below 4 for the integrative paper may submit a second version of the paper provided the first version was handed in on time.

Repeating students: Those who have only failed the laboratory practicals may carry their marks for the other assessment activities over to the next year if they wish. Repeating students who have passed the laboratory practicals must retake all activities except the practicals, for which they may carry over the mark from the previous year. During the first week of classes, students who find themselves in one of the above situations must tell the lecturer in charge of the course whether they wish to carry over their mark from the previous year.

Activities schedule: The dates for continuous assessment and for handing in coursework are posted on the Campus Virtual and may subsequently be altered. Students are notified of any changes to these dates through the Campus Virtual and in class, as these are the established channels for lecturers and students to exchange information.

Awarding a distinction: In order to pass the coue with honors, the final grade must be equal or higher to 9 points. Because the number of students with this distinction can not exceed 5% of the number of students enrolled in the course, it is given to whoever has the highest final marks

Further important points regarding assessment:Without detriment to other disciplinary measures that may be deemed appropriate, and in accordance with the academic regulations, in the case of misconduct on the part of a student that could affect the marking of an assessed activity, the grade given to this activity will be nought (0). In such cases the corresponding activities cannot be reassessed. If any of these assessment activities needs to be passed in order to pass the course, a failing grade is automatically given for the course, with no reassessment opportunities within the same academic year. Some examples of such misconduct are as follows.

- Complete or partial copying of a practical, a report or any other assessment activity. Allowing someone to copy.
- Submitting group coursework not done entirely by the members of the group (applied to all the members, not only those who did not do the work).

- Submitting material produced by a third party, irrespective of whether the material has been translated or adapted and, in general, submitting work that contains elements that are not original and unique to the student.
- Unauthorized use of AI (e.g., Copilot, ChatGPT, or equivalents) to solve exercises, assignments, and/or any other assessable activity.
- Having communication devices, such as mobile phones, smart watches, or pens with cameras, which are accessible during a test.
- Talking to fellow students during a test.
- Copying or trying to copy from other students during a test.
- Using or trying to use a text related to the subject area during a test, unless this is explicitly allowed.

If the course is not passed because the minimum mark is not obtained in one of the assessment activities, the numerical grade that is to appear on the student's academic record is the lowest value between 4.5 and the weighted average of all the marks. As exceptions to this, a grade of "Not assessed (NA)" is assigned to students who have taken none of the assessment activities and, in the case of a student who has engaged in misconduct in an assessment activity, the numerical grade to be placed on the student's academic record is the lowest value between 3.0 and the weighted average of all the marks (which means that the fail cannot be condoned). In future editions of this course, none of the assessment activities taken by students who have engaged in misconduct in an assessment activity will be carried over. In summary: engaging in (or trying to engage in) copying, allowing someone to copy, or plagiarism in any assessment activity leads to a non-condonable grade of "Fail", and no marks for elements of the course can be carried over to later years.

This subject does not provide for a unified evaluation system.

Bibliography

Basic bibliography:

- Forouzan, B.A. (2022). Transmisión de datos y redes de comunicaciones. 5e. McGraw-Hill Interamericana de España S.L. (ebook)
- Forouzan, B.A.; Mosharraf, F. (2021). Computer Networks. A Top-Down Approach. Pearson Education, Inc.
- Garcia Teodoro, P. (2014). Transmisión de datos y redes de computadoras. 2e. Pearson.
- Panko, R.R.; Panko, J.L. (2018). Business Data Networs and Security. 11e. Pearson Educations, Inc.
- Stallings, W. (2013). Data and Computer Communications. 10e. Prentice-Hall. (ebook)
- Stallings, W. (2016). Foundations of Modern Networking: SDN, NFV, QoE, IoT, and Cloud. 1e. Addison-Wesley Professional
- Tomsho, G. (2019). Guide to Networking Essentials. 8e. Course Technology Inc

Web links:

- Autònoma Interactiva - Campus Virtual: https://cv.uab.cat

Software

Software used in the course is open source

Language list

Name	Group	Language	Semester	Turn

(PAUL) Classroom practices	451	Catalan	second semester	morning-mixed
(PAUL) Classroom practices	452	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	451	Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	452	Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	453	Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	454	Spanish	second semester	morning-mixed
(TE) Theory	450	Catalan	second semester	morning-mixed