Networks

Code: 102746
ECTS Credits: 6

2025/2026

Degree	Type	Year
Computer Engineering	OB	2

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Teaching groups languages

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

Prerequisites

There are no prerequisites. However, students should be familiar with the most basic concepts of Operating Systems. It is also recommended for students to have taken the courses on basic programming.

In case of discrepancies between the versions of this guide in different languages, the Catalan version shall prevail.

Objectives and Contextualisation

This is the second course of the subject "Operating Systems and Computer Networks", where the concepts about the operation of TCP/IP based networks (and Internet in particular) are shown, both from the point of view of the network interconnection and from the perspective of the relationship between end computers and applications providing services to users.

The formative objectives of the course are, on the one hand, that students get a general vision of the concepts related to computer networks and with the interconnection of heterogeneous networks; that they thoughfully know the issues and protocols related with the joint operation of heterogeneous systems over a set of interconnected networks and the main distributed application in these systems, with a notion of their

development. On the other hand, students have to be able to design extensible and robust internet networks, to configure connections to internet networks, and to detect and solve network problems due to missconfigurations or protocol attacks.

Competences

- Acquire personal work habits.
- Capacity to design, develop, select and evaluate computer applications and systems, ensuring reliability, security and quality, in accordance with ethical principles, and applicable standards and legislation.
- Conceive and develop centralised or distributed computer systems or architectures by integrating hardware, software and networks.
- Know and apply the basic and main techniques of parallel, concurrent, distributed and real time programming.
- Know and apply the functional and structural characteristics of distributed systems and computer and Internet networks, and design and implement applications based on these.
- Know the characteristics, functionalities and structure of operating systems and design and implement applications based on their services.

Learning Outcomes

1. Analyse the main protocols and know about the international standards and standardisation bodies.
2. Create thread and socket based applications, including mutex primitives and condition-type variables.
3. Design, develop, select and evaluate computer systems, ensuring their reliability, security and quality.
4. Know and apply the basic and main techniques of concurrent and distributed programming.
5. Know and apply the characteristics, functionalities and structure of distributed hardware systems and computer networks to design and implement applications based on the same.
6. Know and understand the concepts related to computer networks , knowing to place them in a hierarchical system protocols .
7. Know how to administer and maintain computer systems, services and applications in terms of the base software.
8. Know the details of local and wide area networks and how they operate.
9. Manage time and resources available. Work in an organized manner .
10. Understand the essential mechanisms of data transmission.
11. Work independently.

Content

Unit 1. Introduction

- Computer networks and network of networks
- The TCP/IP protocol family
- Basic networks typologies and technologies

Unit 2. Netork interconnection protocols

- Principles of network interconnection
- Addressing
- Local address resolution
- IP protocol
- Basic routing
- ICMP Protocol

Unit 3. End-to-end protocols

- Principles of end-to-end communications
- User Datagram Protocol UDP
- Reliable byte stream protocol TCP

Unit 4. Apploication protocols

- Principles of TCP/IP applications
- Application access to lower layers. Socket of Berkeley interface
- Domain Name System DNS
- Configuration Protocol DHCP

Unit 5. Advanced protocols for network interconnections

- Internet architecture
- Autonomous Systems and Neutral Points
- Routing protocols within Autonomous Systems (RIP, OSPF)
- Routing protocols between Autonomous System (BGP)

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Laboratory sessions	12	0.48	7, 4, 5, 2, 3, 9, 11
Problem resolution sessions	12	0.48	1, 8, 4, 6, 3, 10
Theory classes	26	1.04	1, 8, 4, 6, 3, 10
Type: Supervised			
Supervised activities proposed in class	8	0.32	1, 8, 4, 6, 10
Type: Autonomous			
Course problems writing	30	1.2	1, 8, 10, 9, 11
Preparation and autonomous work for the laboratory sessions	24	0.96	7, 4, 5, 2, 3, 9, 11
Study and preparation for the assessment tests	30	1.2	1, 7, 8, 4, 5, 6, 3, 10, 9, 11

These activities will be carried out during the course:

- Lectures (theory sessions), where the teacher will provide information about the knowledge of the course and about strategies to obtain, extend, and organise this knowledge. Student active participation will be encouraged during these sessions, for example by proposing a debate where multiple technological approaches are accepted.
- Problem solving sessions, where students will have to actively participate to consolidate their knowledge by resolving, presenting and debating related problems.
- Laboratory practical sessions, where small projects are proposed to be anlised and developed by groups. These sessions will be prepared, documented, and programmed by the teacher beforehand, and students will have to prepare them before attending to the lab, reviewing theory technological aspects about the development.

- Resolution of problems related to the theory sessions to be discussed during the problem resolution sessions, as a continuous activity during the course.
- Several supervised activities proposed by the teachers during the course to consolidate the knowledge on the subject and to explore its practical application.

There will be no differentiated treatment for students who retake the course.

The UAB virtual platform (Campus Virtual, https://cv.uab.cat/) will be used for communication between teachers and students, and between students. It will be also used to deliver activities and accessing working documents of the course.

Transverse competences worked in this course are T02.01 Autonomous work, and T02.03 Time and available resource management. Working in an organised way. These competences are worked in different parts of the course, such in the resolution of problems, or in the laboratory sessions.

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
Activities	10%. No minimum mark is required for this part	2	0.08	1, 7, 8, 6, 10, 9
Final validation test	40%. The minimum grade required by this part is 5 out of 10	2	0.08	1, 8, 4, 6, 10, 9, 11
Knowledge and skill controls	15%. No minimum mark is required for this part	0.5	0.02	1, 8, 6, 9, 11
Laboratory work validation	15%. The minimum mark required by this part is 4 out of 10	1	0.04	5, 2, 3, 9, 11
Practical case	5%. No minimum mark is required for this part	0.5	0.02	1, 8, 6, 9, 11
Practical laboratory session follow up, with the possibility of undertaking a test during the session	15%. The minimum mark required by this part is 5 out of 10	2	0.08	5, 2, 3, 9, 11

Assessment Criteria

Assessment will be continuous and formative, based on the learning evidence generated by students through class participation activities, tests and final exams for knowledge validation, and laboratory work validation.

Activities and tools used for assessment:

Classroom activities

These are activities carried out during theoretical and problem-solving sessions, without regular periodicity. As in-person activities, they are not mandatory (i.e., completing them is not required to pass the course, although they do contribute to the assessment). Examples include: a comment on a short documentary shown in class, a description of a role-played activity conducted during the session, multiple-choice questions on the just-completed theory or problems session, analyzing the functioning of a routing information exchange protocol, etc.

Tests and final knowledge validation exams

The knowledge and skills tests are individual written exams aimed at validating whether each student is progressively acquiring the subject's content and skills. These tests do not eliminate material for the final exam, nor do they require a minimum passing grade. The final exams for knowledge and lab work validation are individual written tests designed to confirm whether the student has minimally acquired the subject's knowledge, skills, and competencies. These exams are crucial due to the importance placed on the correct mastery of concepts in engineering-related subjects.

Passing both the final knowledge validation exam and the lab validation exam is essential to pass the course.

Practical case

A short test will be given in which the student must individually resolve a practical scenario, applying the skills acquired during the course. This exercise evaluates how well the student has integrated their learning to solve a plausible case theymight encounter in their future professional career.

Laboratory sessions

Lab work will involve a set of predefined sessions in which students, working in teams, will solve specific challenges aimed at developing knowledge, skills, and competencies related to the subject. Specific details about the organization of these sessions (challenges, groups, calendar, weighting, etc.) and their tracking (reports, attendance requirements, etc.) will be available on the Virtual Campus.

Attendance to lab sessions is mandatory (closed format). To be assessed, students must attend at least 80% of the lab sessions.

There will be one or more written tests to validate, individually, the learning outcomes. These validations must be passed to pass the course.

Indicators used to assess learning

For problem-solving and guided work, the indicators used will include individual consistency in the work, cooperation among team members, quality of the output, and participation in the overall learning process. Indicators of quality also include correct use of technical terms, proper paragraph writing, and well-structured content. Consistency in work will also be valued. Well-argued and, if necessary, revised problem solutions will be appreciated.

In class activities, student participation and submitted reports or documents will be assessed. In the practical part, indicators will include preparation (e.g., preliminary reports), active participation in lab sessions, and performance in the final evaluation. In tests and final validation exams (knowledge and lab work), the main indicator will be the correctness of answers to the posed questions.

Note on cheating, plagiarism, and other irregularities

Without prejudice to other disciplinary measures that maybe taken, and in accordance with current academic regulations,any irregularities by a student that may alter the grade of an evaluable activity will result in a zero (0) for that activity. These activities cannot be recovered. If the failed activity is necessary to pass the course, the student will automatically fail the course, with no opportunity for recovery in the same academic year.

These irregularities include, but are not limited to:

- Total or partial copying of a lab assignment, report, or any evaluable activity;

- Allowing someone else to copy;
- Submitting a group project (from this or previous years) that was not entirely produced by the group members (this applies to all members, not only those who did not work);
- Presenting third-party material as one's own, even if translated or adapted, and in general, submitting non-original or non-exclusive work (including content generated with AI tools such as ChatGPT, Copilot, etc.);
- Having communication devices (phones, smartwatches, pens with cameras, etc.) accessible during individual assessments;
- Speaking with classmates during individual assessments;
- Copying or attempting to copy from others during assessments;
- Using or attempting to use unauthorized written materials during assessments.

The final numerical grade in the academic record will be the lower value between 3.0 and the weighted average grade if the student has committed irregularities (i.e., passing by compensation will not be allowed). In future editions of the subject, no assessments will be validated for students who committed such irregularities.

In summary: copying, allowing copying, or plagiarizing (or attempting to do so) in any assessment activity means a FAIL, withno possibility of compensation or validation.

Use of generative Artificial Intelligence tools

This course acknowledges the increasing use of generative AI as a support tool and allows its limited use.In general, thesetools may be used to improve formal aspects of work such as writing style, clarity, grammar, or translation, and to receive occasional assistance with technical aspects.

It is not acceptable to use generative AI tools to generate content that is subject to assessment, such as methodological approaches, design, execution of experiments, analysis or interpretation of results, idea development, or drawing conclusions. These must be carried out entirely by the student, as they form the core intellectual and creative work required to pass the subject.

Given the diversity of assignments, students are advised to consult their instructor in case of doubt.

In any case, students must explicitly declare in each report or deliverable whether AI tools have been used, specifying which ones, for what purpose, and to what extent. Irresponsible, excessive, or unnecessary use may negatively affect the final grade. Undeclared or inappropriate use may result in failing the course.

Final grade

The final grade, which reflects knowledge, skills, and competency acquisition, will be calculated as the weighted average of the assessment components as follows:

- 40%: Final knowledge validation exam (minimum grade required: 5 out of 10).
- 15%: Laboratory sessions (minimum grade required: 4 out of 10).
- 15%: Lab validation test (minimum grade required: 5 out of 10).
- 15%: Knowledge and skillstests (no minimum grade required).
- 5%: Practical case (no minimum grade required).
- 10%: Class activities (no minimum grade required).

The final score for the 20% corresponding to the tests (15%) and the practical case (5%), referred to as CSP, will depend on the grade obtained in the final knowledge exam. If the CSP grade is equal to or greater than 1.5

and the final exam grade is at least5, then CSP will beraised to the higher of its actual grade or 5. This is because the final exam evaluates the full theoretical content of the course.

If the student does not pass the course because one or more components did not meet the required minimum grade, the final transcript grade will be the lower of 4.0 or the weighted average of all grades.

Exceptions:

- A "Not Assessed" (NA) grade will be given to students who do not participate in any assessment activity.
- If the student commits irregularities, the final grade will be the lower of 3.0 or the weighted average, meaning compensation will not be allowed.

Awarding distinctions (honours) will take into account active participation, contributions to problem-solving in the course forum, completion of optional challenges announced during the course, the final course grade, and the grade of the final exam.

Only students who have not taken part in any assessment activity may receive a "Not Assessed" grade.

Assessment calendar

- Ongoing: Class activities and lab sessions, including required reports.
- During lab sessions: Assessment of preliminary or foundational aspects.
- Throughout the term: Knowledge tests and practical case.
- End of term: Final knowledge validation exam and lab validation exam.

Dates will be posted on the Virtual Campus and may be rescheduled due to unforeseen circumstances. Any changes will be communicated via the Virtual Campus, which is the primary communication tool between instructors and students.

A make-up session will be scheduled for students who fail the final knowledge validation exam or the lab validation exam on their first attempt.

Classroom activities, tests, and the practical case cannot be retaken, as they do not require a minimum grade and are part of continuous assessment (they make no sense outside theiroriginal context).

All assessment activities can be reviewed.

Validations

There will be no automatic validations, and repeating students will not receive any special treatment. Validations must be explicitly requested, following the procedure explained on the first day of class.

Single assessment

This course cannot be assessed using the single-assessment procedure.

Bibliography

Basic references:

- D.E. Comer (2013). Internetworking with TCP/IP. Prentice Hall.

Supplementary references:

- G. Tomsho (2019). Guide to Networking Essentials, 6th Edition. Cengage.
- W. R. Stevens (1993). TCP/IP Illustrated, Volume I. Addison-Wesley.
- A.S. Tanenbaum (2021). Computer Networks, 6th Edition.Pearson.
- W. Stallings (2015). Comunicaciones y redes de computadores, 10a Edición. Pearson Prentice Hall.
- N. Barcia, C. Fernández, S. Frutos, G. López, L. Mengual, F.J. Soriano, F.J. Yágüez (2005). Redes de computadores y arquitecturas de comunicaciones. Supuestos prácticos. Pearson Prentice Hall.

Web links:

- cv.uab.cat
- http://www.cs.purdue.edu/homes/dec/netbooks.html

Software

This course will only use free software, such as the GNU/Linux operating system.

Groups and Languages

Please note that this information is provisional until 30 November 2025. You can check it through this link. To consult the language you will need to enter the CODE of the subject.

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	411	English	second semester	morning-mixed
(PAUL) Classroom practices	412	English	second semester	morning-mixed
(PAUL) Classroom practices	431	Catalan/Spanish	second semester	morning-mixed
(PAUL) Classroom practices	432	Catalan/Spanish	second semester	morning-mixed
(PAUL) Classroom practices	451	Catalan/Spanish	second semester	afternoon
(PAUL) Classroom practices	452	Catalan/Spanish	second semester	afternoon
(PAUL) Classroom practices	471	Catalan/Spanish	second semester	afternoon
(PLAB) Practical laboratories	411	English	second semester	morning-mixed
(PLAB) Practical laboratories	412	English	second semester	morning-mixed
(PLAB) Practical laboratories	413	English	second semester	morning-mixed
(PLAB) Practical laboratories	414	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	415	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	416	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	417	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	418	Catalan/Spanish	second semester	morning-mixed

(PLAB) Practical laboratories	419	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	420	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	421	Catalan/Spanish	second semester	afternoon
(PLAB) Practical laboratories	422	Catalan/Spanish	second semester	afternoon
(PLAB) Practical laboratories	423	Catalan/Spanish	second semester	afternoon
(PLAB) Practical laboratories	424	Catalan/Spanish	second semester	afternoon
(TE) Theory	41	English	second semester	morning-mixed
(TE) Theory	43	Catalan/Spanish	second semester	morning-mixed
(TE) Theory	45	Catalan/Spanish	second semester	afternoon
(TE) Theory	47	Catalan/Spanish	second semester	afternoon