UAB
Universitat Autònoma de Barcelona

Computer Networks and Internet

Code: 104353
ECTS Credits: 6

2025/2026

Degree	Type	Year
Data Engineering	FB	1

Contact

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Teachers

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Teaching groups languages

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Prerequisites

There are no prerequisites, although it will be useful to have basic knowledge of Linux and of the Python programming language.

Objectives and Contextualisation

In this course, 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

- Design efficient algorithmic solutions to computational problems, implement them in the form of robust software developments which are structured and easy to maintain, and verify their validity.

- Develop critical thinking and reasoning and know how to communicate it effectively in both your own language and in English.
- Generate innovative and competitive proposals in professional activity and research.
- Handle large volumes of heterogeneous data.
- Prevent and solve problems, adapt to unforeseen situations and take decisions.
- Search, select and manage information and knowledge responsibly.
- Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
- Transmit data with efficiency, precision and security.
- Work cooperatively in complex and uncertain environments and with limited resources in a multidisciplinary context, assuming and respecting the role of the different members of the group.

Learning Outcomes

1. Analyse and evaluate the advantages and disadvantages of a lossy, a lossless and a quasi-lossless compression.
2. Apply the characteristics, functions and structure of computer networks to design and implement applications based on them.
3. Develop critical thinking and reasoning and know how to communicate it effectively in both your own language and in English.
4. Distinguish between local and wide-area networks and apply international standards and interconnection mechanisms.
5. Formulate methods for information compression and encoding for error correction.
6. Generate innovative and competitive proposals in professional activity and research.
7. Identify the concepts related to computer networks, placing them within a hierarchical system of protocols.
8. Perform queries on databases.
9. Prevent and solve problems, adapt to unforeseen situations and take decisions.
10. Scale the databases needed for a specific designed service.
11. Search, select and manage information and knowledge responsibly.
12. Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
13. Work cooperatively in complex and uncertain environments and with limited resources in a multidisciplinary context, assuming and respecting the role of the different members of the group.

Content

Computer networks

- Computer networks
- Basic networks typologies and technologies
- Principles of network interconnection
- Addressing

Internet protocols

- The TCP/IP protocol family
- Layer2 / Layer3 interactions: direct/indirect delivery and local address resolution (ARP)
- IP protocol: addresses, routes, fragmentation, subnetting
- ICMP Protocol
- User Datagram Protocol UDP
- Reliable byte stream protocol TCP
- Sockets
- Domain Name System DNS
- Configuration Protocol DHCP

Internet organization

- Internet architecture, authoritative organizations and social implications
- Autonomous Systems and Neutral Points
- Automatic route configuration

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Laboratory sessions	12	0.48	2, 10, 8, 5, 6, 9, 12, 13
Problem resolution sessions	12	0.48	1, 4, 5, 7
Theory classes	26	1.04	1, 3, 4, 5, 7
Type: Autonomous			
Preparation and autonomous work for the laboratory sessions	31	1.24	2, 11, 5, 6, 9, 13
Study and preparation for the assessment tests	25	1	1, 11, 3, 4, 5, 6, 7, 9, 12
Study and solution of the course challenges (missions)	37	1.48	1, 2, 11, 3, 4, 6, 7, 9, 12, 13

The course is structured in three session types:

- 13x 2h class sessions (large group)
- 12x 1h class sessions (small groups)
- 12x 1h lab sessions (smaller groups)

Class sessions are vertebrated via 9-10 practical study cases ("missions") designed to exercise the full extent of the course's goal competences. Specific activities will revolve around:

- Solving doubts about the course contents and provided practice materials
- Receiving and providing feedback about the study cases ("missions")
- Complementary discussion and other supervised activities

Unlike other courses, no time will be devoted to the professor reading slides or any other materials readily available to the students. Instead, a full study guide containing a primer to all of the course's contents (as well as substancial practice material) is presented at the beginning of the course. Students will be expected to study the relevant parts of this guide as part of their autonomous work prior to the session(s) where those parts and exercises will be discussed. Failing to comply with this aspect will severely affect the practical value of the presential sessions.

Lab sessions will be structured through 2-4 hands-on, computer-based problems/challenges that exercise the whole course contents, and extend them with concrete, real-life networking tools and environments.

In-class sessions will be conducted analogically, i.e., no computers will be allowed. Lab rooms contain all necessary digital equipement, but personal computer use will be allowed. In neither of these session types will attendance be controlled nor be made part of the evaluation criteria. Students disturbing the class development or failing to respect each and every other person in the room will be requested to leave the presential session.

There will not be differentiated treatment for students who repeat the subject (no convalidations).

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

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
Entrega final del laboratori i prova de validació	35%. The minimum mark required by this part is 5 out of 10	2	0.08	1, 2, 11, 3, 10, 4, 8, 5, 6, 7, 9, 12, 13
Final exam	40%. The minimum grade required by this part is 5 out of 10	3	0.12	3, 4, 5, 7, 9
Short tests	25%. No minimum mark is required for this part	2	0.08	4, 7

Assessment Criteria and Activities

The only assessment criterion for the course is the demonstrable achievement of conceptual and applied competencies. Formal evidence of this achievement will be accepted through the following formal evaluation activities:

A1: First short exam
A2: Second short exam
A3: Final exam
A4: Final exam resit
A5: Lab submission and test

Each exam activity assesses all concepts discussed in the course up to the date of that test. These exams are designed in the spirit of the practical cases analyzed throughout the course; that is, they simultaneously engage multiple concepts and require precise and technically correct answers. For this reason, students must be aware that a superficial review of the materials will not likely be sufficient to achieve a passing grade.

Lab submissions are assessed separately to measure the more applied aspects of the subject. The correct submission of all mandatory deliverables is a necessary condition for passing. Informative feedback will be provided for all intermediate submissions. The final, mandatory submission will be assessed based on its correctness, scope, and the author's ability to explain and defend their solution. In addition to submitting a correct and unique solution, students will be requiredto pass a hybrid theoretico-practical test designed to verify the solution's authorship and the true acquisition of the applied skills discussed in this part of the subject. Failure to pass this test will result in a non-passing grade both in the Lab assessment and the course as a whole.

Assessment System

The course consists of two parts assessed separately: exams and lab work. Both parts must be passed independently in order to pass the course.

- 65% of the final grade corresponds to the exam activities (A1-A4). Two short exams will be held during the course.
  25% of the final grade will be calculated as:
  MAX(0.5 × (A1 + A2), A2, A3, A4)
  The remaining 40% will be: MAX(A3, A4)

  This system allows students to demonstrate learning at different times and address previously identified deficiencies.
  Note: Passing the final exam or its resit (MAX(A3, A4)) is essential in order to pass this part and, therefore, the course.

- 35% of the final grade corresponds to the final lab submission and accompanying test (A5). Only informative feedback will be provided for the intermediate lab submissions proposed during the course.

Honors distinctions will be granted based strictly on the final score (which must be at least 9.0), and only at the professor's discretion.

This course does not offer the option of a single final assessment.

The assessment dates will be published on the Virtual Campus and may be subject to change due to unforeseen circumstances. Any changes will be communicated via the same channel, which is considered the main communication medium between faculty and students.

Grades for each assessable activity will be published and made available to all students, in accordance with UAB regulations. Exams will be graded using a common rubric. The detailed application of this rubric will be provided individually as part of formative feedback. Students will be able to review the grades of all assessed activities.

Retakes and Failing Grades

The final exam (activity A3) can be resat through activity A4. There is no retake option for the short exams (A1, A2).

The lab component can also be retaken through a new submission and/or a written test.

Without prejudice to applicable disciplinary measures and in accordance with current academic regulations, irregularities in assessable activities will result in a grade of zero (0) for the affected activity. These activities will not be recoverable. If passing the activity is a requirement for passing the course, the course will be considered failed with no option for recovery within the same academic year.

Irregularities include (among others):

- Total or partial copying of a practical assignment, report, or any other assessable activity
- Allowing others to copy your own work
- Submitting group work not entirely completed by all listed authors
- Unauthorized use of AI tools (such as GitHub Copilot, ChatGPT or similar) to solve exercises, assignments, or assessable activities (see note below)
- Presenting third-party materials as your own, including translations or adaptations
- Possessing communication devices (mobile phones, smartwatches, camera pens, etc.) during individual exams
- Speaking with others during individual exams
- Copying or attempting to copy during tests

- Using or attempting to use unauthorized materials, unless explicitly permitted

In this course, the use of Artificial Intelligence (AI) technologies is not permitted at any stage. Any work that includes AI-generated content will be considered a breach of academic integrity and may result in partial or total penalties to the grade for the activity, or more severe sanctions in serious cases.

If the course is not passed due to not achieving the minimum required grade in one or more activities, the final grade will be thelower value between 3.0 and the weighted average of all activities.

Exceptions:

- Students who do not participate in any assessable activity will receive a grade of "Not assessable".
- Students who commit an academic irregularity will receive a grade of 3.0 (or the weighted average, if lower). These students will not be eligible for compensated pass.

In summary: copying, allowing copying, plagiarism, or any similar attempt in assessable activities will result in a non-compensable fail.

Bibliography

Basic references:

- M. Hernández-Cabronero. *XOI Study Guide*. Online: https://github.com/miguelinux314/uab-xoi.
- Comer, Douglas E. *Internetworking with TCP/IP Volume One*. 6th ed. Harlow: Pearson Education UK, 2013. Print.
  Available: https://bibcercador.uab.cat/permalink/34CSUC_UAB/1c3utr0/cdi_proquest_ebookcentral_EBC5137558

Supplementary references:

- G. Tomsho (2011). Guide to Networking Essentials, 6th Edition. Cengage.
- W. R. Stevens (1993). TCP/IP Illustrated, Volume I. Addison-Wesley.
- A.S. Tanenbaum (2002). Computer Networks, 4th Edition. Prentice Hall.
- W. Stallings (2004). Comunicaciones y redes de computadores, 7a 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

Main software:

- Linux
- Bash
- Python
- Netcat
- Lxc
- Ns-3
- Wireshark

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	811	Catalan/Spanish	second semester	morning-mixed
(PAUL) Classroom practices	812	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	1	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	2	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	3	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	4	Catalan/Spanish	second semester	morning-mixed
(TE) Theory	81	Catalan/Spanish	second semester	morning-mixed