UAB
Universitat Autònoma de Barcelona

Distributed Systems

Code: 102740
ECTS Credits: 6

2025/2026

Degree	Type	Year
Computer Engineering	OB	3
Computer Engineering	OT	4

Contact

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Teachers

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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 Computer Fundamentals, Computer Structure, Operating Systems and Computer Networks. It is also recommended for students to have notions of Linux System.

Objectives and Contextualisation

The main objective of the subject is to understand cloud computing systems, be able to manage them and develop applications that make use fo them. It will be necessary to know their main principles, base technologies, offered services and a broad view of their usage.

Competences

Computer Engineering

- Acquire personal work 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.
- Conceive and develop centralised or distributed computer systems or architectures by integrating hardware, software and networks.
- Have the capacity to analyse and evaluate computer architectures, including parallel and distributed platforms, and develop and optimise software for the same.
- Have the capacity to analyse, evaluate, select and configure hardware platforms for the development and execution of computer applications and services.
- Have the capacity to conceive network technology based systems, applications and services, including Internet, Web, e-commerce, multimedia, interactive services and mobile computers.
- Have the capacity to design and implement system and of communications software.
- Work in teams.

Learning Outcomes

1. Analyse accessibility and security needs in accordance with the different types of users and different types of applications.
2. Analyse and evaluate the programming models and paradigms for distributed systems.
3. Analyse the characteristics of distributed systems.
4. Apply the concepts of operating systems and networks to develop the necessary software components to manage a high performance computer system and the communications involved in these systems.
5. Classify the different types of architecture for distributed systems, considering aspects relative to hardware and its interconnection, and to the software components of the system.
6. Communicate efficiently, orally or in writing, knowledge, results and skills, both in the professional environment and before non-expert audiences.
7. Conceive network technology based hardware systems, including Internet, web, e-commerce, multimedia, interactive services and mobile computation.
8. Describe the basic performance parameters of distributed computing systems.
9. Design computer solutions that integrate accessibility and security needs in a distributed system.
10. Design efficient base software for distributed systems.
11. Design network technology based systems, applications and services.
12. Evaluate and select distributed systems depending on performance index.
13. Evaluate the functionality and features of applications that run on distributed platforms.
14. Identify the architectures of distributed systems.
15. Identify the basic components that define the accessibility, ergonomics, usability and security of computer systems.
16. Identify the characteristics of distributed systems considering the available network technologies.
17. Identify the software levels that a distributed system should comprise.
18. Prevent and solve problems.
19. Propose IT solutions based on distributed systems that integrate in the architecture of the hardware components of the system, as well as the interconnection of the same, and the design of the necessary software.
20. Work cooperatively.

Content

1 - Introduction to Cloud Computing: benefits, challenges and risks.

2 - Cloud Computing Models: Infrastructure / Platform / Software as a Service.

3 - Virtual private cloud and node network configuration

4 - Basic computation services

5 - Basic storage services

6 - Elasticity and scalability

7 - Cost evaluation: Total Cost of Ownership

8 - Containers

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Supervised			
Exercises	10	0.4	2, 3, 1, 12, 13, 6, 11, 18, 19, 20
Laboratory practices	14.5	0.58	2, 3, 12, 13, 6, 7, 8, 9, 11, 10, 18, 19, 20
Theory	22	0.88	2, 3, 4, 12, 5, 7, 8, 11, 17, 14, 16, 18, 19
Type: Autonomous			
Personal work	93	3.72	2, 3, 1, 5, 7, 15, 17, 14, 16

Methodology

During the course, different types of teaching activities can be distinguished:

Lectures: These involve the exposition of the theoretical content for each topic in the syllabus. The typical structure of a lecture is as follows: first, an introduction presenting the session's objectives and the topics to be covered; then, the content will be developed, including narrative explanations and formal developments that provide theoretical foundations, interspersed with examples illustrating the application of the concepts presented. Finally, the instructor will summarize the main conclusions. Continuous assessment of thematic blocks will take place throughout the course.

All study materials are provided in English to preserve the original technical terminology. These materials will not be translated into Catalan or Spanish, as students are expected to reach a minimum comprehension level equivalent to B2 upon graduation.

Problem-solving and practical sessions: The practical component of the theoretical topics is complemented by problem-solving sessions and laboratory practices. In these sessions, students will develop programs and applied tasks to address a specific problem, which will be introduced at the beginning of the unit/module/topic. Some of these exercises must be submitted during the session, while others will have specified submission deadlines. Laboratory work must be completed in groups of three students. Several lab sessions are included in the course schedule, during which students will carry out the assigned tasks.

The statements for problem sets and lab assignments may be written in either Catalan or Spanish. Students may complete and submit any coursework in Catalan, Spanish,or English.

This teaching approach is designed to promote active learning and to develop competencies in organization and planning, oral and written communication, teamwork, and critical thinking. Particular attention will be paid to the quality, presentation, and functionality of the submitted exercises.

Students are strongly encouraged to bring their laptops to both lectures and problem-solving sessions, as hands-on exercises using AWS or Azure will be regularly conducted to reinforce theoretical concepts.

Course management will be handled through the Virtual Campus (https://cv.uab.cat/), which will be used to access materials, manage lab groups, submit assignments, check grades, communicate with teaching staff, etc.

The use of generative artificial intelligence tools is strictly prohibited for all theoretical and practical coursework. If a student is found to have used such tools for any assignment, they will automatically receive a failing grade (final numeric grade of 3) and will lose the right to take both midterm exams and the resit exam.

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
Laboratory practices	40%	2	0.08	2, 3, 4, 12, 13, 6, 7, 9, 11, 10, 17, 14, 18, 19, 20
Parcial tests	60%	8.5	0.34	2, 3, 1, 4, 12, 5, 7, 8, 9, 15, 17, 14, 16, 19

This course does not offer a single-assessment system. Repeating students must complete all planned activities, both theoretical and practical; that is, there will be no differentiated treatment for repeating students.

The course consists of three parts: Theory, Problem Solving, and Laboratory Work. The Theory and Problem Solving components account for 60% of the final grade, while Laboratory Work makes up the remaining 40%.

The dates for continuous assessment tests and lab sessions will be published on the virtual campus at the beginning of the course and may be subject to rescheduling due to possible contingencies. All changes will be communicated through the virtual campus, which is understood to be the standard communication channel between faculty and students.

Honors distinctions ("matrícula de honor") will be awarded based on five percent (or fraction thereof) of the total number of students enrolled across all course groups. Only students with a final grade equal to or greater than 9 will be eligible.

The assessment method for each part of the course (Theory, Problem Solving, and Laboratory Work) is detailed below:

Theory and Problem Solving

The course will follow a continuous assessment methodology that allows students to progressively eliminate material as they advance. Two written continuous assessment tests are scheduled:

- The first test (P1) will take place during the midterm exam week.
- The second test (P2) willtake place during the final exam week.

Exact dates will be published at the beginning of the course and may change due to contingencies. All updates will be announced via the virtual campus, as this is considered the standard information exchange tool between faculty and students.

Each test will account for 30% of the final course grade.

To be eligible to take the second continuous assessment test (P2), students must achieve a minimum score of 3.5 in the first test (P1). Otherwise, they must take the resit exam (ER), which will cover the entire course content. Additionally, if the average score of P1 and P2 is below 5, the student must also take the resit exam in order to pass the course.

For each test, the time, date, and location for review sessions will be provided. Students may review their test with the instructor during this session. If a student does not attend the scheduled review, no subsequent review will be allowed.

Students wishing to attend the review session must notify their theory instructor by email at least 24 hours in advance. If no notification is given within this timeframe, the test will not be reviewed.

During the review session, exercises will not be explained or solved. The test will be shown solely for the student to identify errors and understand the rationale behind the grade received.

Exam solutions will not be published on the virtual campus. Students wishing to see the solution to a particular question must request a tutorial session after the review process has concluded.

Retaken Exam

Only studentswho have not passed the continuous assessment-either because they did not reach the minimum score of 5 out of 10, or because they did not follow it-are eligible to take the resit exam.

This exam will cover the full syllabus and will have a maximum score of 7 points. A minimum score of 5 is required for the theoretical part to be averaged with the lab grade. A score below 5 will result in failing the course.

Any attempt to cheat during an assessment activity-either during the activity or in the grading process-will result in a final course grade of 3, and a disciplinary case will be opened and recorded in the student's academic file.

The teaching staff reserves the right to modify the format of midterm and final exams as deemed appropriate, regardless of formats used in previous years.

Laboratory Sessions

Lab work will be assessed based on the work completed during lab sessions and on the reports written for each session. Lab work must be done in groups of three students.

Attendance to lab sessions is mandatory. Missing a session will result in failure of the practical component and, consequently, failure of the course. In the case of a justified absence, it must be reported in advance to the instructor and an official signed justification must be provided within the established timeframe. Notification must always occur prior to the session.

It is important to clarify that personal travel and work-related reasons are not considered valid justifications, since the practical session calendar is available from the beginning of the course.

Justified, non-medical absences must be rescheduled for another session within the same week. Only students who justify their absence due to illness will be exempt from this rescheduling. In any case, missing the assigned session and thereby preventing group work will require the student to complete the lab individually.

Full attendance for the entire duration of each lab session is required. Attendance will be recorded at the beginning of the session, and again at the end, when the instructor will inquire about the work completed. Each group member will be assessed individually. The grading breakdown for lab components will be specified in the course's detailed guidelines.

All lab sessions carry the same weight. The specific grading criteria for each session will be included in the corresponding assignment. It is the student's responsibility to read this information carefully and to ensure they sign the attendance sheet for each session.

Arriving more than 15 minutes late will be recorded as a "no-show," and the session cannot be made up. This condition will not apply to students who provide an official justification for the delay (e.g., a medical attendance certificate).

Lab sessions cannot be retaken. A minimum average score of 5 is required to pass this component. There is no minimum score required for individual labs in order to calculate the overall average.

Plagiarism and Cheating

Without prejudice to other disciplinary measures that may apply, and in accordance with current academic regulations, any irregularities committed by a student that may affect the grading of an assessment activity will result in a score of zero (0). Activities graded in this manner will not be eligible for retake. If passing one of these activities is necessary to pass the course, the course will be failed without the possibility of passing it within the same academic year.

Such irregularities include, but are not limited to:

- total or partial copying of a lab, report, or any other graded activity; allowing others to copy;
- unauthorized use of AI tools (e.g., Copilot, ChatGPT, or similar) in any graded activity will result in a score of zero;
- submitting a group assignment not fully completed by the group members (this applies to all members, not just those who didn't contribute);
- submitting materials created by third parties, including translations or adaptations, or any work that is not original and exclusively the student's own;
- having communication devices (e.g., mobile phones, smartwatches, camera pens, etc.) accessible during individual theoretical-practical assessment sessions (exams);
- talking to peers during individual theoretical-practical assessment sessions (exams);
- copying or attempting to copy from other students during theoretical-practical assessments (exams);
- using or attempting to use materials related to the subject during theoretical-practical assessments (exams), unless explicitly allowed.

In summary: copying, allowing others to copy, or committing plagiarism (or attempting to) in any assessment activity will result in a FAIL, with no compensation or recognition of partial components in future academic years.

If a student fails the course because they did not meet the minimum required grade in any assessment activity, the final grade will be the lower of either 4.5 or the weighted average of all grades. Exceptions: students who do not participate in any assessment activities will receive a grade of "Not Assessed," and students who commit irregularities in any assessment activity will receive a final grade equal to the lower of 3.0 or the weighted average of their grades (and therefore cannot pass the course by compensation).

Bibliography

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-Microsoft Azure Essentials - Fundamentals of Azure, 2nd Ed; Michael Collier, Robin Shahan; 2016; https://download.microsoft.com/download/6/6/2/662DD05E-BAD7-46EF-9431-135F9BAE6332/9781509302963_I

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-G. Coulouris, J. Dollimore and T. Kinderg, "Distributed Systems. Concepts and design ", Addison-Wesley, 5th edition, 2012

Software

Visual Studio Code

Python

Azure Cloud

AWS Cloud

Google Cloud

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	431	Catalan/Spanish	first semester	morning-mixed
(PAUL) Classroom practices	451	Catalan/Spanish	first semester	morning-mixed
(PAUL) Classroom practices	452	Catalan/Spanish	first semester	morning-mixed
(PLAB) Practical laboratories	431	Catalan/Spanish	first semester	morning-mixed
(PLAB) Practical laboratories	432	Catalan/Spanish	first semester	morning-mixed
(PLAB) Practical laboratories	451	Catalan/Spanish	first semester	morning-mixed
(PLAB) Practical laboratories	452	Catalan/Spanish	first semester	morning-mixed
(PLAB) Practical laboratories	453	Catalan/Spanish	first semester	morning-mixed
(PLAB) Practical laboratories	454	Catalan/Spanish	first semester	morning-mixed
(PLAB) Practical laboratories	455	Catalan/Spanish	first semester	morning-mixed
(TE) Theory	430	Catalan/Spanish	first semester	morning-mixed
(TE) Theory	450	Catalan/Spanish	first semester	morning-mixed