

Distributed Programming

Code: 106556
ECTS Credits: 6

2025/2026

Degree	Type	Year
Artificial Intelligence	OB	3

Contact

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Teaching groups languages

You can view this information at the [end](#) of this document.

Prerequisites

This subject has no pre-requirements. It is recommended to have completed the Programming and Computation fundamental Courses.

Objectives and Contextualisation

The objective of this course is to be able to use cloud computing systems and be able to develop computer applications and manage cloud systems. That is why it is necessary to know the systems in the cloud, the technologies they use, the services they provide and it is necessary to understand how they work.

Competences

- Analyse and solve problems effectively, generating innovative and creative proposals to achieve objectives.
- Conceptualize and model alternatives of complex solutions to problems of application of artificial intelligence in different fields and create prototypes that demonstrate the validity of the proposed system.
- Design, implement, analyse and validate efficient and robust algorithmic solutions to computational problems derived from the design of intelligent systems.

- Develop critical thinking to analyse alternatives and proposals, both one's own and those of others, in a well-founded and argued manner.
- Introduce changes to methods and processes in the field of knowledge in order to provide innovative responses to society's needs and demands.
- Students can apply the knowledge to their own work or vocation in a professional manner and have the powers generally demonstrated by preparing and defending arguments and solving problems within their area of study.
- Work cooperatively to achieve common objectives, assuming own responsibility and respecting the role of the different members of the team.

Learning Outcomes

1. Analyse and evaluate computer architectures in parallel and distributed platforms.
2. Analyse and solve problems effectively, generating innovative and creative proposals to achieve objectives.
3. Develop and optimise software for parallel and distributed platforms based on the most common existing paradigms.
4. Develop critical thinking to analyse alternatives and proposals, both one's own and those of others, in a well-founded and argued manner.
5. Implement and optimise applications based on the functionalities and structure of parallel, distributed and cloud systems.
6. Propose new methods or informed alternative solutions.
7. Students can apply the knowledge to their own work or vocation in a professional manner and have the powers generally demonstrated by preparing and defending arguments and solving problems within their area of study.
8. Understand and apply the fundamental principles and basic techniques of parallel, concurrent and distributed programming.
9. Use the most suitable tools and methodologies to evaluate the functionality and performance of the parallel / distributed applications developed.
10. Use virtualized and private-public cloud infrastructures to run applications.
11. Weigh up the risks and opportunities of both your own and others' proposals for improvement.
12. Work cooperatively to achieve common objectives, assuming own responsibility and respecting the role of the different members of the team.

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
- 9-AI Services

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Lab	23	0.92	1, 2, 3, 5, 7, 12, 10, 9
Theoretical classes	23	0.92	1, 8, 3, 4, 11, 6, 7
Type: Autonomous			
Autonomous study	40	1.6	2, 4, 5, 11, 10
pre-lab work	42	1.68	2, 8, 3, 5, 11, 6, 12

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.

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.

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

Continuous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Individual exam 1	25	2	0.08	2, 8, 4, 6, 9
Individual exam 2	25	2	0.08	2, 8, 4, 6, 9
Lab work	50	18	0.72	1, 3, 5, 11, 7, 12, 10, 9

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 50% of the final grade, while Laboratory Work makes up the remaining 50%.

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) will take 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 25% 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 students who 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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Software

We will use some cloud provider industrial platforms

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	711	English	second semester	morning-mixed
(PLAB) Practical laboratories	711	English	second semester	morning-mixed
(PLAB) Practical laboratories	712	English	second semester	morning-mixed
(TE) Theory	71	English	second semester	morning-mixed