

Degree programme	Type	Course
Bachelor in Artificial Intelligence	OB	2

Contact lecturer

Name : Javier Panadero Martinez

Email : javier.panadero@uab.cat

Prerequisites

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

Group languages

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

Objectives

The objective of this course is to provide students with the knowledge and skills required to develop computer applications and manage cloud computing systems. To achieve this, students will gain an understanding of cloud computing architectures, the underlying technologies, the services they provide, and the principles governing their operation.

Learning outcomes

- CM05 (Plan the deployment of AI applications using distributed cloud platforms and massive data storage tools.) Plan the deployment of AI applications using distributed cloud platforms and massive data storage tools.
- KM17 (Identify the basic concepts and principles of distributed data systems and cloud architectures for massive data processing.) Identify the basic concepts and principles of distributed data systems and cloud architectures for massive data processing.
- SM19 (Use virtualised and private-public cloud infrastructures to run AI applications.) Use virtualised and private-public cloud infrastructures to run AI applications.
- SM20 (Analyse computer architectures on distributed platforms to optimise performance in the execution of applications.) Analyse computer architectures on distributed platforms to optimise performance in the execution of applications.

Contents

- 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

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Theory sessions	23	0.92	KM17, SM19, SM20
Lab sessions	23	0.92	CM05
Self-study	40	1.6	KM17
Lab preparation	40	1.6	CM05, SM20

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.

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	Weight	Hours	ECTS	Learning outcomes
Individual Assessment 1 (First Midterm Exam)	25	2	0.08	KM17, SM20
Individual Assessment 2 (Second Midterm Exam)	25	2	0.08	KM17, SM20
Laboratory Assignments	50	20	0.8	CM05, SM19

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.

Neither the exam nor the solutions will 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. A minimum score of 1 out of 10 is required in each individual practical assignment for the average mark of the practical component to be calculated. If a score below 1 out of 10 is obtained in any of the practical assignments, the average mark cannot be calculated and, consequently, the practical component will be considered failed.

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.

Bibliography

- Dan C. Marinescu. "Cloud Computing. Theory and Practice". Morgan-Kaufmann. 2018.
- AWS Certified Cloud Practitioner Study Guide; Ben Piper, David Clinton; Sybex (14 de junio de 2019); ISBN-10: 1119490707, ISBN-13: 978-1119490708
- The Practice of System and Network Administration: Volume 1: DevOps and other Best Practices for Enterprise IT; Thomas A. Limoncelli, Strata R. Chalup; Addison-Wesley Educational Publishers Inc; Edición: 01 (3 de septiembre de 2014); ISBN-10: 032194318X, ISBN-13: 978-0321943187
- Infrastructure as Code; Kief Morris; O'Reilly Media; 1 edition (June 17, 2016); ISBN-10: 1491924357, ISBN-13: 978-1491924358
- Cloud Computing for Science and Engineering; Ian Foster, Dennis B. Gannon; The MIT Press; Edición: 1 (27 de octubre de 2017); Colección: Scientific and Engineering Computation; ISBN-10: 9780262037242, ISBN-13: 978-0262037242
- Amazon Web Services in Action, 2E; Andreas Wittig, Michael Wittig; Manning Publications; Edición: 2nd edition (30 de septiembre de 2018); ISBN-10: 1617295116, ISBN-13: 978-1617295119
- Microsoft Azure Essentials - Fundamentals of Azure, 2nd Ed; Michael Collier, Robin Shahan; 2016; <https://download.microsoft.com/download/6/6/2/662DD05E-BAD7-46EF-9431-135F9BAE6332/978150930...>
- Cloud Computing : An Introduction. Chopra, Rajiv Mercury Learning & Information 2017. ISBN: ISBN number:, ISBN number:9781683920939
- Cloud Computing for Dummies. Hurwitz, Judith S.;Bloor, Robin;y más John Wiley & Sons, Incorporated 2009. ISBN: ISBN number:9780470484708, ISBN number:9780470597408

- Hybrid Cloud for Dummies. Hurwitz, Judith S.;Kaufman, Marcia;y más John Wiley & Sons, Incorporated 2012. ISBN: ISBN number:9781118127193, ISBN number:9781118224878
- Heroku Cloud Application Development. Hanjura, Anubhav Packt Publishing, Limited 2014. ISBN: ISBN number:9781783550975, ISBN number:9781783550982
- Cloud Enterprise Architecture. Raj, Pethuru Auerbach Publishers, Incorporated 2012. ISBN: ISBN number:9781466502321, ISBN number:9781466502338
- Moving to the Cloud. Sitaram, Dinkar ;Manjunath, Geetha Elsevier Science & Technology Books Elsevier Science & Technology Books 2011. ISBN: 9781597497251, 9781597497268

Adicional:

- Big Data : Principles and Paradigms. Buyya, Rajkumar;Calheiros, Rodrigo N.;y más Elsevier Science & Technology 2016. ISBN: ISBN number:9780128053942, ISBN number:9780128093467
- Fog and Edge Computing : Principles and Paradigms : Principles and Paradigm. Suyya, Rajkumar; Srirama, Satish Narayana John Wiley & Sons, Incorporated 2019. SBN: ISBN number:9781119524984, ISBN number:9781119525011. ERIE: Wiley Series on Parallel and Distributed Computing Services.

Software

We will use some cloud provider industrial platforms

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this [link](#). To access the information, you will need to enter the course CODE

Type of teaching	Group	Language	Semester	Shift
(TE) Theory	1	English	second semester	afternoon
(PAUL) Classroom practices	1	English	second semester	afternoon
(PLAB) Practical laboratories	1	English	second semester	afternoon

(PAUL) Classroom practices	2	English	second semester	afternoon
(PLAB) Practical laboratories	2	English	second semester	afternoon
(PLAB) Practical laboratories	3	English	second semester	afternoon
(PLAB) Practical laboratories	4	English	second semester	afternoon