Course guide
270531 - CC - Cloud Computing

Last modified: 03/02/2025

Unit in charge: Barcelona School of Informatics
Teaching unit: 701 - DAC - Department of Computer Architecture.

Degree: MASTER'S DEGREE IN INFORMATICS ENGINEERING (Syllabus 2012). (Optional subject).

Academic year: 2024 **ECTS Credits:** 3.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: JORDI TORRES VIÑALS

Others: Segon quadrimestre:
JORDI TORRES VIÑALS - 10

PRIOR SKILLS

Python is the programming language of choice for the labs' sessions of this course. It is assumed that the student has a basic knowledge of Python prior to starting classes. Also, some experience with Linux basics will be necessary.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CDG1. Capability to integrate technologies, applications, services and systems of Informatics Engineering, in general and in broader and multicisciplinary contexts.
CTE6. Capability to design and evaluate operating systems and servers, and applications and systems based on distributed computing.
CTE9. Capability to apply mathematical, statistical and artificial intelligence methods to model, design and develop applications, services, intelligent systems and knowledge-based systems.

Generical:
CG1. Capability to plan, calculate and design products, processes and facilities in all areas of Computer Science.
CG4. Capacity for mathematical modeling, calculation and simulation in technology and engineering companies centers, particularly in research, development and innovation tasks in all areas related to Informatics Engineering.
CG6. Capacity for general management, technical management and research projects management, development and innovation in companies and technology centers in the area of Computer Science.
CG7. Capacity for implementation, direction and management of computer manufacturing processes, with guarantee of safety for people and assets, the final quality of the products and their homologation.
CG8. Capability to apply the acquired knowledge and to solve problems in new or unfamiliar environments inside broad and multidisciplinary contexts, being able to integrate this knowledge.

Transversal:
CTR5. APPROPIATE ATTITUDE TOWARDS WORK: Capability to be motivated by professional achievement and to face new challenges, to have a broad vision of the possibilities of a career in the field of informatics engineering. Capability to be motivated by quality and continuous improvement, and to act strictly on professional development. Capability to adapt to technological or organizational changes. Capacity for working in absence of information and/or with time and/or resources constraints.

Basic:
CB6. Ability to apply the acquired knowledge and capacity for solving problems in new or unknown environments within broader (or multidisciplinary) contexts related to their area of study.
CB8. Capability to communicate their conclusions, and the knowledge and rationale underpinning these, to both skilled and unskilled public in a clear and unambiguous way.
CB9. Possession of the learning skills that enable the students to continue studying in a way that will be mainly self-directed or autonomous.

TEACHING METHODOLOGY

Class attendance and participation: Regular and consistent attendance is expected and to be able to discuss concepts covered during class. The theoretical activities include participatory lecture classes, which explain the basic contents of the course. Attendance in class is mandatory unless you have a reason to miss class that is acceptable to the instructor.

Students are responsible for all material and projects are given in class whether they are present or not. It is the responsibility of the student to obtain handouts, assignments, projects, etc. for any missed class from a fellow student.

Hands-on: Activities focused on the acquisition of knowledge through experimentation by "learn by doing" approach mixing theory and practice. Part of the hands-on will be conducted during a regular class sessions and part will be done out of the class sessions. All the hands-on will involve writing a report with all the results to be delivered to the "Racó"

Homework Assignments: Homework will be assigned weekly that includes reading the documentation that expands the concepts introduced during lectures, and periodically will include reading research papers related with the lecture of the week, and prepare presentations (with slides). Some students/groups randomly chosen will present their presentation.

Assessment: There will be 2 short midterm exams along the course.

Student presentation: Students/groups randomly chosen will present the homework (presentations/projects).

Final exam: At the end of the term the student will have an optional exam.

LEARNING OBJECTIVES OF THE SUBJECT

1.Cloud Computing paradigm
2.Cloud Computing technologies
3.Current Paradigms Related to Cloud Computing
4.Under the Hood of Cloud Computing: Hardware and Software for AI
5.Private Cloud Computing Infrastructures for Modern AI Models
6.Learn by doing

STUDY LOAD

Type	Hours	Percentage
Hours large group	13,5	18.00
Hours small group	13,5	18.00
Self study	48,0	64.00

Total learning time: 75 h

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Cloud Computing paradigm

Cloud Computing technologies

Current Paradigms Related to Cloud Computing

Under the Hood of Cloud Computing: Hardware and Software for AI

Private Cloud Computing Infrastructures for Modern AI Models

Midterm 1

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Attendance

Presentation 1

Presentation 2

Presentation 3

Presentation 4

Hands-on 1

Hands-on 2

Hands-on 3

Hands-on 4

Hands-on 5

Hands-on 6

ACTIVITIES

Cloud Computing paradigm

Specific objectives:
1

Related competencies :
CDG1. Capability to integrate technologies, applications, services and systems of Informatics Engineering, in general and in broader and multicisciplinary contexts.
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CG4. Capacity for mathematical modeling, calculation and simulation in technology and engineering companies centers, particularly in research, development and innovation tasks in all areas related to Informatics Engineering.
CG1. Capability to plan, calculate and design products, processes and facilities in all areas of Computer Science.
CTR5. APPROPIATE ATTITUDE TOWARDS WORK: Capability to be motivated by professional achievement and to face new challenges, to have a broad vision of the possibilities of a career in the field of informatics engineering. Capability to be motivated by quality and continuous improvement, and to act strictly on professional development. Capability to adapt to technological or organizational changes. Capacity for working in absence of information and/or with time and/or resources constraints.

Full-or-part-time: 4h
Self study: 2h
Theory classes: 2h

Cloud Computing technologies

Specific objectives:
2

Related competencies :
CB9. Possession of the learning skills that enable the students to continue studying in a way that will be mainly self-directed or autonomous.
CG4. Capacity for mathematical modeling, calculation and simulation in technology and engineering companies centers, particularly in research, development and innovation tasks in all areas related to Informatics Engineering.
CG6. Capacity for general management, technical management and research projects management, development and innovation in companies and technology centers in the area of Computer Science.
CG1. Capability to plan, calculate and design products, processes and facilities in all areas of Computer Science.
CG7. Capacity for implementation, direction and management of computer manufacturing processes, with guarantee of safety for people and assets, the final quality of the products and their homologation.

Full-or-part-time: 6h
Self study: 4h
Theory classes: 2h

Current Paradigms Related to Cloud Computing

Specific objectives:
3

Related competencies :
CB9. Possession of the learning skills that enable the students to continue studying in a way that will be mainly self-directed or autonomous.
CB6. Ability to apply the acquired knowledge and capacity for solving problems in new or unknown environments within broader (or multidisciplinary) contexts related to their area of study.
CDG1. Capability to integrate technologies, applications, services and systems of Informatics Engineering, in general and in broader and multicisciplinary contexts.

Full-or-part-time: 5h
Self study: 4h
Theory classes: 1h

Under the Hood of Cloud Computing: Hardware and Software for AI

Specific objectives:
4

Related competencies :
CTE9. Capability to apply mathematical, statistical and artificial intelligence methods to model, design and develop applications, services, intelligent systems and knowledge-based systems.
CTE6. Capability to design and evaluate operating systems and servers, and applications and systems based on distributed computing.
CG8. Capability to apply the acquired knowledge and to solve problems in new or unfamiliar environments inside broad and multidisciplinary contexts, being able to integrate this knowledge.

Full-or-part-time: 5h
Self study: 4h
Theory classes: 1h

Private Cloud Computing Infrastructures for Modern AI Models

Specific objectives:
5

Related competencies :
CB8. Capability to communicate their conclusions, and the knowledge and rationale underpinning these, to both skilled and unskilled public in a clear and unambiguous way.
CB9. Possession of the learning skills that enable the students to continue studying in a way that will be mainly self-directed or autonomous.
CB6. Ability to apply the acquired knowledge and capacity for solving problems in new or unknown environments within broader (or multidisciplinary) contexts related to their area of study.
CTE9. Capability to apply mathematical, statistical and artificial intelligence methods to model, design and develop applications, services, intelligent systems and knowledge-based systems.
CDG1. Capability to integrate technologies, applications, services and systems of Informatics Engineering, in general and in broader and multicisciplinary contexts.
CTE6. Capability to design and evaluate operating systems and servers, and applications and systems based on distributed computing.

Full-or-part-time: 11h 30m
Self study: 8h
Theory classes: 3h 30m

Hands-on

Specific objectives:
6

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Full-or-part-time: 24h 24m
Self study: 10h 54m
Laboratory classes: 13h 30m

Homeworks (& Presentations)

Specific objectives:
6

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CG7. Capacity for implementation, direction and management of computer manufacturing processes, with guarantee of safety for people and assets, the final quality of the products and their homologation.

Full-or-part-time: 9h
Self study: 7h
Theory classes: 2h

Midterms

Specific objectives:
1, 2, 3, 4, 5, 6

Related competencies :
CB8. Capability to communicate their conclusions, and the knowledge and rationale underpinning these, to both skilled and unskilled public in a clear and unambiguous way.
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Full-or-part-time: 10h
Self study: 8h
Theory classes: 2h

Attendance

Specific objectives:
1, 2, 3, 4, 5, 6

Related competencies :
CB8. Capability to communicate their conclusions, and the knowledge and rationale underpinning these, to both skilled and unskilled public in a clear and unambiguous way.
CB9. Possession of the learning skills that enable the students to continue studying in a way that will be mainly self-directed or autonomous.
CB6. Ability to apply the acquired knowledge and capacity for solving problems in new or unknown environments within broader (or multidisciplinary) contexts related to their area of study.
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GRADING SYSTEM

The evaluation for this course will be based on a continuous assessment system, considering the following components:
- In-class exams (midterms): 10% of the final grade.
- Attendance and participation in class: 15% of the final grade.
- Homework, reading papers, and presentations: 20% of the final grade.
- Hands-on activities (including corresponding reports/presentations): 55% of the final grade.

Requirements for Continuous Assessment:
To qualify for continuous assessment, students must meet the following criteria:
- Attendance: A minimum of 80% of class sessions.
- Homework and presentations: Completion of at least 50%.
- Hands-on activities: Completion of at least 50%.

Final Exam Option:
Students who do not meet the requirements for continuous assessment will have the option to take a final exam. This exam will evaluate knowledge of the entire course (practical, theoretical, and self-learning components, including homework). The exam will be announced during the course. No documentation (neither printed nor digital) is allowed during the exam.

BIBLIOGRAPHY

Basic:
- Torres, J. Hand-on sessions at GitHub.
- Torres, J. Slides of the course.
- Bond, J. The enterprise cloud : best practices for transforming legacy IT. Sebastopol: O'Really Media, Inc., 2015.
- Bagghi S., Siddiqui M., Wood P. and Zhang H,. "Dependability in Edge Computing". Communications of the ACM [on line]. [Consultation: 15/03/2021]. Available on: https://doi.org/10.1145/3362068.- Castro P., Ishakian V., Muthusamy V. and Slominsky A. "The rise of serverless computing". Communications of the ACM [on line]. november 2019 [Consultation: 15/03/2021]. Available on: https://dl.acm.org/doi/pdf/10.1145/3368454.

Complementary:
- Russo B., Valle L., Bonzagni G., Locatello D., Pancaldi M. Tosi D. "Cloud computing and the new EU General Data Protection RegulationRusso B., Valle L., Bonzagni G., Locatello D., Pancaldi M. Tosi D". IEEE Cloud Computing [on line]. Volume: 5, Issue: 6, Nov./Dec. 2018 [Consultation: 15/03/2021]. Available on: https://ieeexplore-ieee-org.recursos.biblioteca.upc.edu/document/8552651.

RESOURCES

Hyperlink:
- http://