

Subject identification

Subject	11539 - Cloud Computing
Credits	1.44 de presencials (36 hours) 4.56 de no presencials (114 hours) 6 de totals (150 hours).
Group	Group 1, 1S (Campus Extens)
Teaching period	First semester
Teaching language	English

Professors

Lecturers	Horari d'atenció als alumnes					
	Starting time	Finishing time	Day	Start date	Finish date	Office
Carlos Guerrero Tomé carlos.guerrero@uib.es	16:30	18:00	Tuesday	19/09/2016	31/07/2017	218
	09:00	10:30	Wednesday	19/09/2016	31/07/2017	218

Contextualisation

The subject of cloud computing is a subject of the first semester of the first year of the master in computer engineering. The objectives of the subject are framed within the need to know the models and types of cloud computing, the architecture and the administration of these systems, the new models of data management and the processing of them, besides others important topics for computer systems such as energy efficiency and energy consumption.

Cloud computing systems are based on the idea of delivering system resources as services. This new service delivery model allows users to access a catalog of standardized services to meet their business needs in a more flexible and adaptable way.

Likewise, the cloud computing paradigm allows to increase the number of services offered through the Internet. In this way, it benefits the suppliers, facilitating the way to distribute and offer new services, and to the users, who will be able to enjoy a greater number of services in a faster way.

From the point of view of architecture, which is the focus of this subject, the technology that allows to offer this new business model is the capacity of machine virtualization and distributed computing. In this way data storage and data processing techniques, or programming, can be implemented based on the distribution.

Requirements

The subject is framed in the first semester of the first course of the master, so there is no prerequisite related to subjects of the master, apart from knowledge and skills acquired in a degree or engineering in computer

science. Although advanced knowledge of computer architectures is recommended, especially in Grid and Cluster systems.

Skills

Specific

- * CE1. Ability to model, design, define architecture, implement, manage, operate, manage and maintain applications, networks, systems, services and IT contents..
- * CE2. Ability to understand and apply the operation and organization of the Internet, technologies and protocols of new generation networks, component models, intermediary software and services..
- * CE3. Ability to design and evaluate operating systems and servers, and applications and systems based on distributed computing..
- * CE4. Ability to design and develop systems, applications and IT services in embedded and ubiquitous systems..

Generic

- * CG1. Capacity for mathematical modeling, calculation and simulation in technology centers and company engineering, particularly in research, development and innovation, in all fields related to Computer Engineering..

Basic

- * You may consult the basic competencies students will have to achieve by the end of the Master's degree at the following address: http://estudis.uib.cat/master/comp_basiques/

Content

Theme content

1. Cloud computing definition
 - Introduction
 - Paralell and distributed computing
 - Vritualization
 - Cloud computing types
 - Reference model: SaaS, PaaS and IaaS
2. Cloud computing architecture and management
 - Resource virtualization
 - Resource management
 - Network support
 - Security
 - Complex systems and self-organization

3. Cloud computing power consumption
 - Energy efficiency and green cloud computing
 - Energy-based resource allocation
 - Interclouds
4. New data management models
 - Storage technologies evolution
 - Storage models, file systems and databases
 - Distributed data bases
 - noSQL Databases
5. New process programming models
 - Concurrent computing
 - High performance computing
 - Data intensive computing

Teaching methodology

This section details the activities that will be carried out to evaluate the acquisition of the competences of the subject. These activities are face-to-face or autonomous. In the case of the latter, the use of Campus Extens has been incorporated to achieve a more flexible and autonomous teaching process. Activities are also divided into individual and group work. All the management of the subject will be carried out from the Campus Extens platform where the communication, the delivery of activities, the publication of contents, etc. will be carried out.

In order to reach the acquisition of all the competences of the subject, the student will have to carry out all the scheduled activities.

In-class work activities

Modality	Name	Typ. Grp.	Description	Hours
Theory classes	Class explanations	Large group (G)	Expository Method / Masterclass: This methodology focuses on the verbal exposition by the teacher of the contents on the subject matter of study. The teacher provides students with essential and organized information from various sources with predefined specific objectives. In the master class the teacher must motivate the students, expose the contents of a topic, explain knowledge, perform demonstrations, present experiences, etc. The use of new technologies, as well as the use of audiovisual resources, is now essential in the expository method. The active agent and not merely passive. In the use of this type of methodology the teacher will use all the necessary educational resources: projection of slides and other interactive, videos, etc. The student's participation and interaction with him is also essential in the new educational environments.	22

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Modality	Name	Typ. Grp.	Description	Hours
Seminars and workshops	Workshops	Medium group (M)	<p>Case Study: the process consists in the presentation by the teacher of a concrete case, of variable extension according to the organizational design, for its study along with a script of work that guides that process. Thus, this methodology implies an analytical part in order to know the problems, interpret it, solve it and contemplate different scenarios and Alternative solution procedures. It is usually developed in three stages, one of presentation and familiarization of the subject, a second of analysis of the case and a third of preparation of conclusions and recommendations. Depending on the length of the case study, the incorporation of on-line documentation and information resources can be particularly interesting. The ICTs allow the members of the study group and the teacher to be in permanent contact and to temporarily extend all the interactive processes.</p> <p>Resolution of Exercises and Problems: Here are developed the appropriate and correct solutions to applied aspects of the subject. They help to promote the comprehension of the contents of a subject as well as the importance of it, allow the reflection on a theoretical content or practical situation, and veridican the utility and validity of a content. It is a method of teaching aspects applied to science and technology in the case at hand.</p>	5
Practical classes	Practical work	Large group (G)	<p>Project-based learning: Implementation of a project to solve a problem, applying skills and knowledge acquired. This methodology is also structured in four stages of realization and evaluation phase of the same. This type of work is very suitable for the use of all types of ICTs and on-line resources.</p>	8
ECTS tutorials	Tutorials	Medium group (M)	<p>Personalized help relationship in which a teacher-tutor attends, facilitates and guides one or more students in the training process</p>	1

At the beginning of the semester a schedule of the subject will be made available to students through the UIBdigital platform. The schedule shall at least include the dates when the continuing assessment tests will be conducted and the hand-in dates for the assignments. In addition, the lecturer shall inform students as to whether the subject work plan will be carried out through the schedule or through another way included in the Campus Extens platform.

Distance education work activities

Modality	Name	Description	Hours
Group self-study	Team work	Preparation of seminars, readings, researches, works, memories, obtaining and analysis of data, etc. To exhibit or deliver in class through the work of students in a group.	46
Group or individual self-study	Individual work	The same activities as the previous modality, but carried out individually, also includes personal study (preparing exams, library work, supplementary reading, doing problems and exercises, etc.), which is fundamental for learning autonomous.	68

Specific risks and protective measures

The learning activities of this course do not entail specific health or safety risks for the students and therefore no special protective measures are needed.

Student learning assessment

A series of activities have been designed to evaluate the student's competences. The table in this section shows the characteristics of each one. All must be delivered and exceed a minimum grade, otherwise the student will be suspended.

All activities evaluated will be scored with a score of 0 to 10, and each will be weighted to calculate the final average of the subject. The evaluation of the subject is composed of three parts. The exams, the delivery of exercises, and the accomplishment of works and projects.

The fact of copying a work, activity, exercise, etc. to a companion or from some content in the web, book, etc. Will suppose the automatic suspension of the subject and the not possible recovery of any of the parts of the same one.

To be able to surpass the subject it is obligatory to surpass a minimum note in each one of the activities in which the subject is composed. This minimum grade is 3. The final weighted average grade must always be higher than 5 to consider that the student has passed. If it is lower it will be suspended and the note that will appear in the minutes will be the weighted average. In the event that the weighted final grade exceeds 5 but has not passed any of the individual minimum marks, your final grade will be suspended with a value of 4.

The report of the course will indicate that a student is "Not present" when only one third (or less) of the evaluation activities provided for in the teaching guide.

Class explanations

Modality	Theory classes
Technique	Extended-response, discursive examinations (retrievable)
Description	Expository Method / Masterclass: This methodology focuses on the verbal exposition by the teacher of the contents on the subject matter of study. The teacher provides students with essential and organized information from various sources with predefined specific objectives. In the master class the teacher must motivate the students, expose the contents of a topic, explain knowledge, perform demonstrations, present experiences, etc. The use of new technologies, as well as the use of audiovisual resources, is now essential in the expository method. The active agent and not merely passive. In the use of this type of methodology the teacher will use all the necessary educational resources: projection of slides and other interactive, videos, etc. The student's participation and interaction with him is also essential in the new educational environments.
Assessment criteria	A test will be conducted to assess whether the student has acquired the necessary knowledge. Competences CE1, CE2, CE3 and CE4 will be evaluated

Final grade percentage: 35% with minimum grade 3

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Workshops

Modality	Seminars and workshops
Technique	Student internship dissertation (non-retrievable)
Description	Case Study: the process consists in the presentation by the teacher of a concrete case, of variable extension according to the organizational design, for its study along with a script of work that guides that process. Thus, this methodology implies an analytical part in order to know the problems, interpret it, solve it and contemplate different scenarios and Alternative solution procedures. It is usually developed in three stages, one of presentation and familiarization of the subject, a second of analysis of the case and a third of preparation of conclusions and recommendations. Depending on the length of the case study, the incorporation of on-line documentation and information resources can be particularly interesting. The ICTs allow the members of the study group and the teacher to be in permanent contact and to temporarily extend all the interactive processes. Resolution of Exercises and Problems: Here are developed the appropriate and correct solutions to applied aspects of the subject. They help to promote the comprehension of the contents of a subject as well as the importance of it, allow the reflection on a theoretical content or practical situation, and veridican the utility and validity of a content. It is a method of teaching aspects applied to science and technology in the case at hand.
Assessment criteria	The students will carry out a series of works that will include reading, understanding and explanation of scientific articles, the accomplishment of exercises, and the explanation of contents related to the subject. The competences CG1, CE2
Final grade percentage:	10% with minimum grade 3

Practical work

Modality	Practical classes
Technique	Papers and projects (non-retrievable)
Description	Project-based learning: Implementation of a project to solve a problem, applying skills and knowledge acquired. This methodology is also structured in four stages of realization and evaluation phase of the same. This type of work is very suitable for the use of all types of ICTs and on-line resources.
Assessment criteria	Students will do some work based on the use of cloud-based tools. The competences CE3
Final grade percentage:	10% with minimum grade 3

Tutorials

Modality	ECTS tutorials
Technique	Observation techniques (non-retrievable)
Description	Personalized help relationship in which a teacher-tutor attends, facilitates and guides one or more students in the training process
Assessment criteria	During the personalized meetings with the student, the observation of the same will be carried out in order to assess their participation, knowledge, etc. Competences CE1, CE2, CE3 and CE4 will be evaluated
Final grade percentage:	5% with minimum grade 3

Teaching guide

Team work

Modality	Group self-study
Technique	Papers and projects (non-retrievable)
Description	Preparation of seminars, readings, researches, works, memories, obtaining and analysis of data, etc. To exhibit or deliver in class through the work of students in a group.
Assessment criteria	The students will carry out an activity of a greater magnitude and that will be developed in a continuous way throughout the course. This activity will consist of developing a larger project in which they use several of the tools / techniques seen in class. Competencies CG1, CE3 and CE4 will be evaluated

Final grade percentage: 20% with minimum grade 3

Individual work

Modality	Group or individual self-study
Technique	Papers and projects (non-retrievable)
Description	The same activities as the previous modality, but carried out individually, also includes personal study (preparing exams, library work, supplementary reading, doing problems and exercises, etc.), which is fundamental for learning autonomous.
Assessment criteria	Students, individually, should choose one of the subjects seen in class and carry out a much more detailed analysis of the state of the art of the same, by reading articles. In addition, the student must present a paper in the form of an article in which this state of the art is analyzed, and which includes an experimentation or improvement proposal within that scope. Competencies CG1, CE1 and CE2 will be evaluated.

Final grade percentage: 20% with minimum grade 3

Resources, bibliography and additional documentation

Basic bibliography

MARINESCU, D.; Cloud Computing, theory and practice. Morgan Kaufmann Publishers, 2013
BUYYA, R.; VECCHIOLA, C.; THAMARAI, S.; Mastering Cloud Computing, Foundations and Applications Programming. Morgan Kaufmann Publishers, 2013