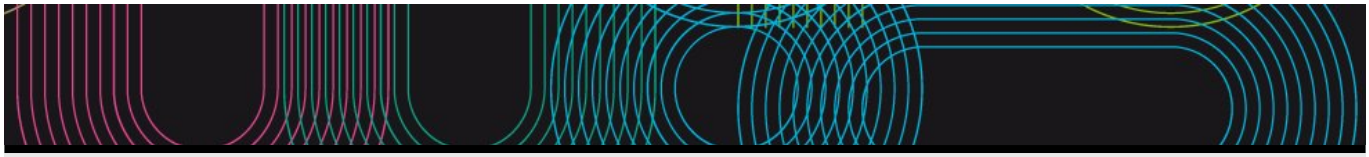

IDENTIFYING DATA				
Distributed Computing				
Subject	Distributed Computing			
Code	V05M145V01321			
Study programme	Telecommunication Engineering			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	5	Optional	2nd	1st
Teaching language	Spanish			
Department				
Coordinator	Mikic Fonte, Fernando Ariel			
Lecturers	Burguillo Rial, Juan Carlos Mikic Fonte, Fernando Ariel Rodríguez Hernández, Pedro Salvador			
E-mail	mikic@gist.uvigo.es			
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General description	This course will provide a vision of group of the most usual technologies inside the distributed computing. They will tackle subjects such as the distributed transactions and the replication; the grid computing, cloud computing, and cluster computing; the distributed artificial intelligence; and the parallel and evolutionary computing. We will use Spanish and Galician languages in classroom, and English language for the instructional materials.			

Competencies	
Code	
A2	CB2 Students must apply their knowledge and ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study.
A4	CB4 Students must communicate their conclusions, and the knowledge and reasons stating them-, to specialists and non-specialists in a clear and unambiguous way.
A5	CB5 Students must have learning skills to allow themselves to continue studying in largely self-directed or autonomous way
B8	CG8 Ability to apply acquired knowledge and to solve problems in new or unfamiliar environments within broader and multidiscipline contexts, being able to integrate knowledge.
C24	CE24/TE1 Ability to understand the fundamentals of distributed systems and distributed computing paradigms, and its application in the design, development and management in grid, ubiquitous computing scenarios and cloud systems.

Learning outcomes	
Expected results from this subject	Training and Learning Results
To earn skills in the design, development and management of distributed systems.	A2 B8 C24
To undertand the functional bases of the distributed systems.	A4 A5 C24
To know the distinct concepts related with the distributed computing: clustering, grids, cloud computing and ubiquitous computing.	A5 B8 C24
To earn skills for the application of intelligent systems in the distributed computing.	A2 A5 B8 C24

To learn how to distribute the execution of tasks for the resolution of problems and optimisation by means of evolutionary and parallel computing.	A2 A4 B8 C24

Contents	
Topic	
1. Distributed artificial intelligence	1. Intelligent agents and multiagent systems 2. Theory of games applied to multiagent systems: coordination, competition, negotiation, auctions, electronic trade 3. Complex distributed systems and auto-organised ones
2. Parallel and evolutionary computation	1. Distributed Computing and parallelization 2. Algorithms and evolutionary programming: genetics, memetics, differential evolution, intelligence of swarm. 3. Optimisation by means of evolutionary technics and parallelization
3. Transactions	1. Concurrency problems 2. Recoverability problems 3. Deadlocks 4. Optimistic concurrency control 5. Timestamps
4. Replication	1. Introduction to replication 2. Case studies of high available services (Bayou and Coda) 3. Transactions with replicated data 4. Design of distributed systems: Google case study
5. Grid and Cluster	1. Basic concepts of grid computing 2. Basic concepts of cluster computing.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	17	0	17
Autonomous practices through ICT	9	0	9
Autonomous problem solving	0	92	92
Problem and/or exercise solving	3	0	3
Practices report	0	3	3
Laboratory practice	1	0	1
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Lecturing	Theoretical classes with practical cases. Besides, problems will be proposed for solving them in autonomous way. Competencies related to this activity: CB5 and CE24
Autonomous practices through ICT	Practices in laboratory by means of computers connected in network and/or virtual machines. Competencies related to this activity: CB2, CB4, and CG8
Autonomous problem solving	Study work on the contents of theoretical classes, as well as support for the achievement of laboratory practices. Competencies related to this activity: CB5 and CG8

Personalized assistance	
Methodologies	**Description**
Autonomous practices through ICT	The personalised attention will carry out in the practical part of the course, as in the tutorial time.

Assessment				
	Description	Qualification	Training and Learning Results	
Problem and/or exercise solving	Examinations composed by a series of short answer questions and/or test type ones that the student will have to answer in the classroom individually.	60	A2 A4 A5	B8 C24

Practices report	Detailed report of the tasks during the practices of laboratory carried out in group.	5	A2 A4	B8	C24
Laboratory practice	Assessment of the work carried out by the students during the laboratory practices carried out in group. Level of involvement, participation in the practices, and performance of the work	35	A2 A4 A5	B8	C24

Other comments on the Evaluation

Students can, at first call, decide to be assessed according to a continuous assessment model or by an exam-only assessment. The fact of presenting to the first continuous assessment exam involves opting for this assessment model (otherwise opting for the exam-only asesment model). Once the students choose the continuous assessment model, their grade can never be "Not Submitted". For second call the students will be evaluated using the modality of "exam-only assessment". The scores obtained in first call are not preserved for second call.

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1- CONTINUOUS ASSESSMENT

To pass the course requires a minimum score of 5 points. The score will be the result to add the socres received in each one of the following parts:

- Written exam 1:
    - Dates: Before the middle of the semester
    - Individually
    - Contents: Theoretical content given until this moment
    - Type: Series of short answer questions and/or test type ones
    - Maximum score = 2 points
- Written exam 2:
    - Dates: Official calendar (coinciding with the exam-only assessment for those that opted by this modality)
    - Individually
    - Contents: Theoretical content given until this moment excepting those that already were assessed in the written exam 1.
    - Type: Series of short answer questions and/or test type ones
    - Maximum score = 4 points
- Practices:
    - Dates: Since week 3 to week 11
    - In group:
        - Reports / memories of practice and Laboratory practice: A personalized score is asigned to each member of the group according to the following:
        - Final score of practices = (Memory + Practice) * Weighting factor
            - Memory maximum score = 0.5 points
            - Practice maximum score = 3.5 points
            - Weighting factor = (Observation by the teacher + Peers assessment) / 20
                - Observation by the teacher: About the work carried out by each student observed by the teacher in the classroom (0-10)
                - Peers assessment: Within each group. Each student asseses his/her partners about the work they did (0-10). Then, an arithmetic average is calculated for each student.
    - Maximum score= 4 points

2- EXAM-ONLY ASSESSMENT

To pass the course requires a minimum score of 5 points.

- Written theoretical exam:

- Dates: Official calendar
- Individually
- Contents: Given in the whole theoretical part of the course.
- Type: Series of short answer questions and/or test type ones
- Maximum score= 6 points

- Written practice exam and delivery of practice:
  - Dates of the exam: Official calendar
  - Dates of the delivery of practice: Before the exam (some modifications over the original practices can be required).
  - Individually
  - Contents: Related to the practice and its performance.
  - Type: Series of short answer questions and/or test type ones
  - Maximum score= 4 points

Sources of information

Basic Bibliography

George Coulouris, Jean Dollimore, Tim Kindberg, Gordon Blair, **Distributed systems. Concepts and design**, 5, Addison Wesley, 2011

Michael Wooldridge, **An Introduction to Multiagent Systems**, 2, Addison-Wesley, 2009

A.E. Eiben, J.E. Smith, **Introduction to Evolutionary Computing (Natural Computing Series)**, 2, Springer, 2015

Tom White, **Hadoop: The Definitive Guide**, 3, O'Reilly Media, 2012

Complementary Bibliography

Thomas Rauber, Gudula Rúnger, **Parallel Programming for Multicore and Cluster Systems**, 2, Springer, 2013

Recommendations

Subjects that it is recommended to have taken before

Application Technologies/V05M145V01105