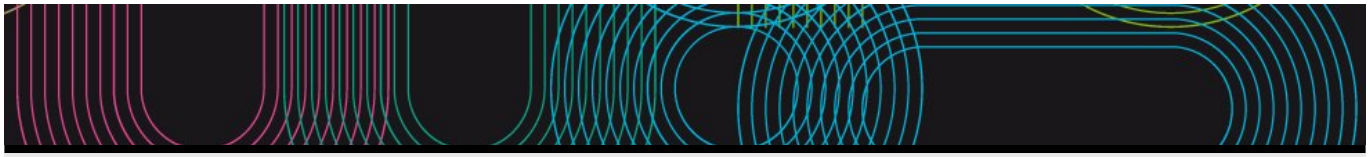

IDENTIFYING DATA				
Distributed Computing				
Subject	Distributed Computing			
Code	V05M145V01321			
Study programme	Telecommunication Engineering			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	5	Optional	2nd	1st
Teaching language	Spanish			
Department				
Coordinator	Mikic Fonte, Fernando Ariel			
Lecturers	Burguillo Rial, Juan Carlos Mikic Fonte, Fernando Ariel Rodríguez Hernández, Pedro Salvador			
E-mail	mikic@det.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 language 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. Transactions	1. Concurrency problems 2. Recoverability problems 3. Deadlocks 4. Optimistic concurrency control 5. Timestamps
2. 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
3. Grid and Cluster	1. Basic concepts of grid computing 2. Basic concepts of cluster computing.
4. 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
5. 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

Planning	Class hours	Hours outside the classroom	Total hours
Master Session	17	0	17
Autonomous practices through ICT	7.5	0	7.5
Autonomous troubleshooting and / or exercises	0	92.5	92.5
Short answer tests	3	0	3
Reports / memories of practice	0	2.5	2.5
Systematic observation	2.5	0	2.5
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	Description
Master Session	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 realised by means of computers connected in network and/or virtual machines. Competencies related to this activity: CB2, CB4, and CG8
Autonomous troubleshooting and / or exercises	Work of study on the contents of the theoretical classes, as well as of support to the realisation and achievement of the practices of laboratory. Competencies related to this activity: CB5 and CG8

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

Short answer tests	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.	70	A2 A4 A5	B8	C24
Reports / memories of practice	Detailed report of the tasks during the realisation of the practices of laboratory carried out in group.	10	A2 A4	B8	C24
Systematic observation	Observation by the professor of the work carried out by the students in the classroom during the realisation of the practices of laboratory carried out in group. Level of participation in those practices and functioning of the work carried out.	20	A2 A4 A5	B8	C24

Other comments on the Evaluation

The students can decide being evaluated according to a model of continuous evaluation (reviewed previously) or realise a final examination. The fact a student answer the first examination of continuous evaluation means he/she opts by this model of evaluation (in contrary case he/she opts by the model of final examination). Once the students opt by the model of continuous evaluation their qualification will not be able to be never "No presented".

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1- CONTINUOUS EVALUATION

To surpass the course requires a minimum qualification of 5 points. The qualification will be the result to add the qualifications received in each one of the following parts:

- Written exam 1:
  - Dates: On the fourth week of the course
  - Individually
  - Contents: Given until this moment
  - Type: Series of short answer questions and/or test type ones
  - Maximum punctuation = 5 points
- Written exam 2:
  - Dates: Official calendar (coinciding with the final examination for those that opted by this modality)
  - Individually
  - Contents: Given until this moment excepting those that already were evaluated in the written exam 1.
  - Type: Series of short answer questions and/or test type ones
  - Maximum punctuation = 2 points
- Practices:
  - Dates: Weeks 6, 7, and 8
  - In group:
    - Reports / memories of practice: The same mark is asigned to each member of the group.
    - Systematic observation: A personalized mark is asigned to each member of the group. This mark is based on the observation by the professor of the work carried out by each student in the classroom during the realisation of the practices of laboratory.
  - Maximum punctuation = 3 points

2- FINAL EXAMINATION

To surpass the course requires a minimum qualification of 5 points.

- Written exam:
  - Dates: Official calendar
  - Individually
  - Contents: Given in the whole course (including practical).
  - Type: Series of short answer questions and/or test type ones
  - Maximum punctuation = 10 points

3- EXTRAORDINARY EVALUATION

The students will be evaluated using the modality of "final examination"

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

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

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

Recommendations