UNIVERSIDADE DA CORUÑA

Teaching Guide				
Identifying Data				2019/20
Subject (*)	Parallel Programming		Code	614473102
Study programme	Mestrado Universitario en Computación de Altas Prestacións / High Performance Computing (Mod. Presencial)			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	1st four-month period	First	Obligatory	6
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Departamento profesorado másterEnxeñaría de Computadores			
Coordinador	Martin Santamaria, Maria Jose	E-mail	maria.martin.santamaria@udc.es	
Lecturers	García Loureiro, Antonio Jesús Martin Santamaria, Maria Jose Pichel Campos, Juan Carlos Touriño Dominguez, Juan	E-mail	maria.martin.santamaria@udc.es juan.tourino@udc.es	
Web	aula.cesga.es			
General description	The global objectives of this subject are: to train the student in the different programming paradigms of parallel computers; to teach software techniques for the design and implementation of algorithms and efficient parallel applications; and apply these techniques in a practical way for the programming of parallel computers with different architectures, using supercomputing resources such as those available at the Galicia Supercomputing Center (CESGA).			

Study programme competences	
Code	Study programme competences
A1	CE1 - Define, evaluate and select the most appropriate architecture and software to solve a problem
A2	CE2 - Analyze and improve the performance of a given architecture or software
A3	CE3 - Know the high performance computing basic concepts
A4	CE4 - Deepen in the knowledge of different programming tools and programming languages in the field of the high performance computing
A5	CE5 - Analyze, design and implement efficient parallel algorithms and applications
B1	CB6 - Possess and understand the knowledge that give a baseline or opportunity to be original in the development and/or application of ideas, often in a research environment
B2	CB7 - The students have to know how to apply the acquired knowledge and their capacity to solve problems in new or hardly explored environment inside wider contexts (or multidiscipinary) related to its area of development
B5	CB10 - The students have to possess learning skills that allows them to continue to study in a mainly self-driven or autonomous manner
B6	CG1 - Be able to search and select useful information to solve complex problems, using the bibliographic sources of the field
B10	CG5 - Be able to work in teams, specially multidisciplinary, and do a proper time and people management and decision taking
C1	CT1 - Use the basic technologies of the information and computing technology field required for the professional development and the long-life learning

Learning outcomes			
Learning outcomes	Study programme competences		
Understand the main organizational differences in parallel architectures	AJ1 AJ3	BJ1 BJ5	
Understand the main programming models	AJ1 AJ3 AJ4		

Apply the knowledge acquired to the efficient implementation of parallel applications using different programming models	AJ2 AJ5	BJ2 BJ6 BJ10	CJ1

Contents	
Topic	**Sub-topic**
Parallel programming	Introduction Parallel programming paradigms Parallel programs using shared memory directives Parallel programs using message-passing libraries

Planning				
Methodologies / tests	**Competencies**	**Ordinary class hours**	**Student?s personal work hours**	**Total hours**
Laboratory practice	A1 A2 A3 A4 A5 B1 B2 B5 B10 C1	18	54	72
Supervised projects	A1 A2 A3 A4 A5 B1 B2 B5 B6 C1	0	54	54
Guest lecture / keynote speech	A1 A2 A3 A4 A5 B1	23	0	23
Personalized attention		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	
Methodologies	**Description**
Laboratory practice	Practical classes in the laboratory to familiarize the students, from a practical point of view, with the contents seen in the theoretical classes.
Supervised projects	Realization of works in which the student has to use the acquired knowledge to solve different problems in an autonomous way.
Guest lecture / keynote speech	Theoretical classes in which the content of each subject is exposed.

Personalized attention	
Methodologies	**Description**
Laboratory practice Supervised projects	The personalized attention in the accomplishment of the laboratory practices and the supervised projects is indispensable to direct to the students in the development of the work. It is recommended that students use the personalized attention to validate the work they are doing.

Assessment			
Methodologies	**Competencies**	**Description**	**Qualification**
Laboratory practice	A1 A2 A3 A4 A5 B1 B2 B5 B10 C1	Evaluación das prácticas	50
Supervised projects	A1 A2 A3 A4 A5 B1 B2 B5 B6 C1	Evaluación dos traballos académicamente dirixidos	50

Assessment comments
The subject is divided into two parts (directive-based programming and message passing). Each part represents 50% of the final grade of the subject. To pass the subject, the student must obtain a minimum grade of 5 averaging both parts, with a minimum of 4 in each one. In the second chance only is possible to improve the grade of the supervised projects. The qualification of the lab practices will be the one obtained previously throughout the academic year.

Sources of information	
Basic	- P. Pacheco (2011). An Introduction to Parallel Programming. Morgan Kaufmann Publishers - F. Almeida, D. Giménez, J.M. Manta, A.M. Vidal (2008). Introducción a la programación paralela. Paraninfo - W.P. Petersen, P. Arbenz (2001). Introduction to Paralell Computing. Oxford University Press - P.S. Pacheco (1997). Parallel Programming with MPI. Morgan Kaufmann Publishers - W. Gropp, E. Lusk and R. Thakur (1999). Using MPI-2. The MIT Press - Barbara Chapman, Gabriele Jost and Ruud Van der Pas (2008). Using OpenMP. The MIT Press
Complementary	

Recommendations
Subjects that it is recommended to have taken before
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Advanced Parallel Programming/614473107
Other comments