UNIVERSIDAD DE MURCIA

FACULTY OF MATHEMATICS

High Performance Scientific Computation

Syllabus

Course code:	6368
Number of ECTS credits:	3
Semester:	2nd (February-June)
Recommended components:	Numerical methods for differential equations (1591), Numerical and variational methods for partial differential equations (1603), Introduction to scientific software and computing (1572), Object oriented programming (1577). The student will benefit from a background in numerical analysis of differential equations.
Language of instruction:	Spanish (students are allowed to ask questions and write homeworks and exams in English)

Course description

Parallel computation, scientific libraries, domain decomposition methods and use of GPUs for solving large scale simulation problems.

We will mainly tackle problems obtained from the numerical analysis of differential equations that lead to large scale computations. We will consider software and hardware issues and allow the student to get in touch with some of the current frontiers of scientific computation.

Learning outcomes and competences

After completion of this course you will:

1. understand the basics of parallel computing
2. use an adecuate programming language
3. know some libraries of high performance computing
4. know how basic differential equations lead to large scale problems

Course contents

I. Introduction to parallel computing

II. Discretization of differential equations

III. Introduction to domain decomposition methods

IV. Use of libraries for solving the approximate problems

References

1. Numerical analysis and optimization : an introduction to mathematical modelling and numerical simulation / Grégoire Allaire ; translated by Alan Craig. Oxford ; New York : Oxford University Press, 2007

2. Python: https://www.python.org/

3. FreeFem++: http://www.freefem.org/ff++/