UE High performance computing

Niveau d'étude
Bac +4

ECTS
3 crédits

Composante
UFR Physique, Ingénierie, Terre, Environnement, Mécanique (PhITEM)

Période de l'année
Printemps (janv. à avril/mai)

Diplômes intégrant cet élément

- Master Mécanique
- Master Physique fondamentale et applications

Langue(s) d'enseignement: Français

Ouvert aux étudiants en échange: Oui

Code d'export Apogée: PAX8IMAB

Présentation

Description

In this course, we will introduce the basics of “classical” high-performance computing (HPC) in the context of applied mathematics.

It will be based on the three main pillars of HPC:

1) Single-core performance:
Students will be made familiar with the basics of computer architectures such as the Instruction Set Architecture (ISA), Memory access, Caches, Registers, Stack, Pipelining, Superscalar execution, SIMD. This allows them to understand the single-core performance of programs.

2) Shared-memory systems:
Students will be made familiar to shared-memory HPC systems and their parallelization models. For practical aspects, we will use the OpenMP programming model with its fork-join and tasking models.

Informations non contractuelles.
Dernière mise à jour le 30 juin 2026

3) Distributed-memory systems:
In this part, the students will learn how to use MPI to parallelize their programs on large scale super computers.

Besides these three main pillars, students will be made familiar to theoretical concepts such as scalability models (Amdahl, Gustafson), Flynn's taxonomy, von-Neumann architecture, etc.

Different **lab assignments** allow the students to gain a practical understanding of high-performance computing.

Heures d'enseignement

CMTD	Cours magistral - Travaux dirigés	9h
TP	TP	18h

Pré-requis recommandés

Programming language:

- Either being already **familiar with the C or C++ programming language**
- **OR** being willing to do a **short tutorial about C on your own**.

Computer fundamentals:

- Binary/hexadecimal systems, floating point numbers
- Using **Linux-based computers**, ssh access to other computers, bash (or being willing to learn this)

Période : Semestre 8

Infos pratiques

Campus

Grenoble - Domaine universitaire

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