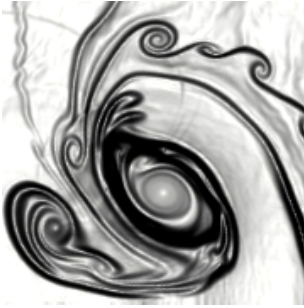**PPSC 2021 Fall**

Programmation et Calcul Scientifique Parallèle
Programming and Parallel Scientific Computing

Lecturers

Elie Hachem
Aurélien Larcher
Jonathan Viquerat

Schedule

32h Courses + Exercises

Week 44

02. November	I/E102
03. November	I/E102
04. November	I/E102

Week 45

09. November	I/E102
10. November	I/E102

Week 46

17. November	I/E102
18. November	I/E102

Week 47

23. November	I/E102

Objectives

The course provides an introduction to C++ programming and algorithms with a focus on scientific computing using CimLib_CFD.

An overview of the C++ language is provided : specification, arithmetics, memory management, object-oriented design for component-based software, and advanced topics using templates.

Distributed and shared-memory parallel computing are then approached with exercises related to numerical linear algebra and solution methods for Partial Differential Equations.

Course content

1. Implementation of numerical algorithms
   — Environment (UNIX/Linux) and standards
   — Integer and Floating-point arithmetics
   — Object-Oriented concepts in C++
   — Template and meta-programming in C++
   — Advanced numerics with the STL
2. Parallel scientific computing
   — Parallel computing architectures
   — Distributed programming models (MPI)
   — Shared memory models (OpenMP)
   — Performance for numerical linear algebra
   — Applications to finite element/finite difference methods

Evaluation

The course is evaluated based on the participation during programming labs and on the final project consisting of the implementation in C++ of a parallel solver for a given PDE :

Lab exercises	25%
Final project	75%