HIGH PERFORMANCE SCIENTIFIC COMPUTING

ECTS
5 credits

Component
École Nationale Supérieure d'Électrotechnique d'Électronique d'Informatique d'Hydraulique et des Télécommunications

In brief

Code: N9EN20

Presentation

Objectives

The aim of this course is to describe up-to-date techniques for the solution of large linear systems on parallel computers. It also introduce duality theory that is a key ingredient in many linear programming solution methods.

Description

This course begins with lectures that present parallel algorithms to solve linear systems arising from partial differential equations on parallel computers. The solution methods depend on the discretization technique that is used : the finite difference and finite element approaches are considered. A special emphasis will be put on the solution of time dependent problems by implicit technique, where scalability for massively parallel computations is reached using suitable mesh partitioning techniques. The course continues with lectures on direct solution methods for sparse linear systems. The objective of these lectures is to provide students with the basic theory behind the factorization of sparse matrices as well as the issues related to the implementation of a sparse, direct solver on modern, parallel computing architectures. Specifically the message will focus on the cost and efficiency of the involved basic linear algebra operations, the issues related to memory consumption, the exploitation of parallelism and concurrency as well as some aspects of numerical stability.

Pre-requisites

Applied mathematics ; Basic optimization ; Programming,

Useful info

Place

Toulouse