

TRANSVERSES FIRELD_10 ECTS

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

High Performance Computing, Tools and methodologies for software development

Introducing

Description

Program (detailed content):

HPC

- Computation of eigenvalues for large systems (2 Lectures, 1 Lab Work)

- Machine architecture: calculation units and typology (CPU, GPU and others), cache memory hierarchy, interconnection networks, principles of spatial and temporal locality, vectorization, etc.

- Parallelization: degrees of parallelism (Amdahl's law, scalability, etc.), shared memory paradigm with OpenMP, distributed memory paradigm with MPI, principles of reduction, data race, etc.

Subtotal: (4 Lectures, 3 Lab Works)

IT tools and methods

- IT development tools and methods: desirable interdisciplinary project implementing IT project management logic: agile project management methods and tools, software engineering methods and tools (object-oriented design and production, advanced algorithmics), collaborative tools, programming support tools, continuous integration tools. The acquisition of the knowledge necessary for the implementation of the tools and methods will be done through self-training through a series of micromodules provided (agile method, Monday, Teams, Trello, GitLab, Linter, Mattermost, Jira, etc.).

(1 Lab Works, 1 Mentored Project=36h)

Objectives

At the end of this module, the student will have understood and will be able to explain (main concepts):

- General concepts of project management and collaborative IT development
- General concepts of high performance computing with parallelization techniques.
- Galerkin approximation of an eigenvalue problem, Krylov spaces and the Arnoldi process

The student must be able to:

- Structuring an IT development project according to its main dimensions and an agile method: organization and comitology, sizing, planning, sprints and main milestones, collaborative development and continuous integration tool chain, communication, documentation
- Know the vocabulary of high performance computing and know the basic elements of parallelization.
- Implement the Arnoldi method for calculating extreme eigenvalues of a matrix

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Practical info

Location(s)

Quality, security, environment

Introducing

Statistics course of 3MIC.

Description

Program (detailed contents):

- Specific QSE: Statistical process control (SPC); notions of metrology; capability of a process; control cards; the SPC system in a company.
- Health and Safety at work: notions of risks, evaluation, prevention, protection.
- Notions of IT security: bases of cryptography; electronic certificates; protocol https; digital signature.

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Practical info

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):

- Mains concepts and tools for quality control
- The principles and stakes in the health and in the safety at work.
- The main concepts of the IT security.

The student will be able to:

- Integrate the aspects of Quality, Security, Environment into the analysis of problems and the development of solutions.

Location(s)

 Toulouse

Necessary prerequisites

For the statistical process control part, the Probability and Statistics course of 2MIC and the Inferential

Reading Seminar (or Challenge based learning)

Introducing

Description

During the Reading Seminar, students will work on different bibliographic resources (research articles, books, digital resources) in order to prepare the S8 Research Innovation project. Their objective will be to understand in depth certain mathematical results or to reproduce certain numerical experiments proposed in the articles. They will produce a summary explaining their work in an educational manner and according to precise specifications (summary, citations, elements of evidence, statement of results, production of graphs).

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):

- Principles and operation of a collaborative work environment
- Project management (PERT, GANTT, WBS)
- Self-evaluation of the results obtained in relation to the objectives.

The student will be able to:

- Produce a synthesis of the results of a research article
- Carry out relevant bibliographic research to deepen the understanding of a mathematical result (theoretical or numerical)
- Work collaboratively in a small group
- Use bibliographic and digital collaborative tools

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Practical info

Location(s)

 Toulouse