

MATH-611

Scientific programming for Engineers

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Cursus	Sem.	Type
Civil & Environmental Engineering		Obl.
Electrical Engineering		Opt.
Mechanics		Opt.

Language of teaching	English
Credits	4
Session	
Exam	Project report
Workload	120h
Hours	56
Lecture	18
Practical work	38
Number of positions	40

Frequency

Every year

Remark

Next time: Fall 2023

Summary

The students will acquire a solid knowledge on the processes necessary to design, write and use scientific software. Software design techniques will be used to program a multi-usage particles code, aiming at providing the link between algorithmic/complexity, optimization and program designs.

Content

Object Oriented Paradigm
 C/C++ and Python programming (class, operator, template, design patterns, STL)
 Programming techniques, code factorization
 Pointers, memory management, data structures
 Linear system solving (Eigen library)
 C++/Python coupling (pybind)
 Post-treatment: Paraview, numpy/scipy, matplotlib

Classical problems: series calculations, solar system and many-body calculation, sparse linear algebra.

Keywords

programming, scientific, code design, algorithm, optimization, analysis

Learning Prerequisites**Required courses**

Basis in programming languages (C/Fortran)
 Basic Linux knowledge is required

Important concepts to start the course

A Linux laptop is required for this class

Expected student activities

Exam: 4 evaluated homeworks

Resources

Moodle Link

- <https://go.epfl.ch/MATH-611>