ENG-270

Computational methods and tools

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Cursus	Sem.	Type
Environmental Sciences and Engineering	BA3	Obl.

Language of teaching	English
Credits	6
Session	Winter
Semester	Fall
Exam	During the semester
Workload	180h
Weeks	14
Hours	**6 weekly**
Lecture	3 weekly
Exercises	3 weekly
Number of positions	

Summary

This course prepares students to use modern computational methods and tools for solving problems in engineering and science.

Content

- Introduction to programming paradigms
- Programming syntax and debugging
- Interpreted and compiled languages
- Memory allocation and management
- Common data exchange formats, I/O, hardware communication
- Network tools
- Version control systems
- Shell scripting and text processing
- Numerical methods and scientific computing
- Data models, data analysis, and visualization

Keywords

- Scientific computing
- Modeling and simulation
- Low level programming
- High level programming
- Data processing
- Data analysis
- Visualization

Learning Prerequisites

Required courses

CS-119 (Information, calcul, communication)

Important concepts to start the course

- File system
- Programming editor, text editor
- Programming basics

Learning Outcomes

By the end of the course, the student must be able to:

- Describe differences among programming paradigms and data models.
- Model a physical or chemical process.
- Develop programs to solve quantitative problems.
- Integrate simpler modules into a larger program
- Interpret program output.
- Choose appropriate computational methods and tools to solve a problem.
- Defend selection and implementation of computational methods and tools.

Transversal skills

- Assess progress against the plan, and adapt the plan as appropriate.
- Plan and carry out activities in a way which makes optimal use of available time and other resources.
- Set objectives and design an action plan to reach those objectives.
- Access and evaluate appropriate sources of information.
- Write a scientific or technical report.

Teaching methods

Lectures, exercises, and project guidance and feedback

Expected student activities

Participate in lectures and exercises, and complete project incorporating computational methods and tools for solving a well-defined problem.

Assessment methods

- Midterm exam (45%)
- Project (55%)

Resources

Moodle Link

- https://go.epfl.ch/ENG-270