MATH-456 **Numerical analysis and computational mathematics**

Grigori Laura

Cursus	Sem.	Type
Computational science and Engineering	MA1, MA3	Opt.
Computational science and engineering minor	H	Opt.
Financial engineering	MA1, MA3	Opt.

Language of teaching	English
Credits	4
Session	Winter
Semester	Fall
Exam	Written
Workload	120h
Weeks	14
Hours	**4 weekly**
Courses	2 weekly
Exercises	2 weekly
Number of positions	

Summary

The course provides an introduction to scientific computing. Several numerical methods are presented for the computer solution of mathematical problems arising in different applications. The software MATLAB is used to solve the problems and verify the theoretical properties of the numerical methods.

Content

- Numerical approximation of nonlinear equations.
- Interpolation, approximation of functions and data.
- Numerical integration and derivation.
- Numerical Linear Algebra (direct and iterative methods).
- Numerical approximation of eigenvalue problems.
- Numerical methods for Ordinary Differential Equations.
- Stability, conditioning, and convergence properties of the numerical methods; error analysis.
- Implementation of the numerical algorithms in MATLAB.

Keywords

Numerical analysis; computational mathematics; numerical approximation; numerical algorithms; MATLAB

Learning Prerequisites

Required courses

Analysis (Calculus); Linear Algebra.

Important concepts to start the course

Basic knowledge of MATLAB.

Learning Outcomes

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

- Choose a numerical method for solving a specific math. problem
- Interpret the numerical results based on the theory
- Apply and implement the numerical algorithms for the solution of mathematical problems
- Assess / Evaluate the numerical errors

Teaching methods

Lectures; theoretical and practical exercises in the computer room.

Assessment methods

Project during the semester (1/3 of the grade) and written exam in the computer room (2/3 of the grade). The exam covers all the theoretical and practical arguments considered at the lectures and exercises. Part of the questions and problems are solved numerically with MATLAB; the exam includes the implementation and programming of numerical algorithms in MATLAB

Supervision

Office hours	No

Resources

Ressources en bibliothèque

- Find the references at the Library

Moodle Link

- https://go.epfl.ch/MATH-456