DPT GENIE MECANIQUE
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Numerical analysis

Numerical Methods

IDENTIFICATION

CODE : GM-3-S2-EC-NUM
ECTS : 3.0

HOURS

Lectures :	10.0 h
Seminars :	22.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	32.0 h
Personal work :	32.0 h
Total :	64.0 h

ASSESSMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

Unknown

AIMS

"The aim of this course is to provide an introduction to numerical methods for the approximate resolution of problems commonly encountered in Mechanics, whether stationary or unsteady, boundary and/or initial value problems.
¿This course, based on a multiphysics and numerical modeling approach in the field of Mechanics, enables students to acquire a fundamental knowledge of Numerical Analysis and a global understanding of how to obtain, implement and exploit a numerical model.

The main skills developed in this course concern the implementation of a numerical problem-solving approach, the choice of a numerical method or scheme, the critical analysis of the numerical results obtained, the dimensioning of the quality and cost of such a numerical result, and finally the use of numerical simulation tools.

The skills developed in this course include choosing a numerical method and scheme, evaluating their advantages and disadvantages, analyzing the quality and cost of a numerical result, implementing a method or scheme numerically, and interpreting and critically analyzing a numerical result.

The student will develop fundamental knowledge in Numerical Analysis, on solving systems of algebraic equations, partial differential equations by the finite-difference method (1D and 2D), as well as systems of initial-valued differential equations by free-step and linked-step schemes."

CONTENT

1. Introduction to numerical modeling and simulation. ¿2. Solving systems of algebraic equations: generalities, direct methods, iterative methods, successive approximation methods, implementation.¿3. Finite-difference method for partial differential equations: Generalities, principles and obtaining 1D schemes, implementation, elements of analysis (consistency, stability, convergence), 2D extensions of the method. 4. Numerical schemes for initial-value problems: Principles, analysis and implementation, single-step methods, multi-step methods, prediction-correction methods, semi-discretization and space-time discretization.

PRE-REQUISITE

Mathematics (S1), Data Science (S1), FIMI Mathematics program (analysis, integration, derivability, linear algebra, eigenvalues and eigenvectors, function sequences and series) - bachelor level, algorithms, ..

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