

Mathematical tools 1

Introducing

Description

Part: Mathematical Concepts

- Generalized integrals and series
- Continuity and differentiability of multivariable functions
- Hessian matrix and optimization

Part: Numerical Analysis

- Introduction to Python and numerical analysis (1 Lab Session)
- Direct resolution of linear systems (Gaussian elimination and LU decomposition)
- Solving nonlinear equations (Bisection, Newton's method, and fixed-point iteration)

Part: Probability and Statistics

- Events, probabilities, conditioning, independence
- Random variables, probability distributions, discrete variables
- Continuous random variables, random vectors
- Statistical inference: point estimation, confidence intervals, and hypothesis testing

Objectives

This Teaching Unit (UE) aims to master the essential concepts and foundational knowledge in mathematics for engineers in Civil Engineering or Mechanical Engineering. The UE is divided into three components with complementary objectives:

1. Mathematical Concepts: Master essential mathematical tools for Civil or Mechanical Engineering.

2. Numerical Analysis: Implement efficient algorithms using Python and analyze their convergence.
3. Probability and Statistics: Understand and apply probabilistic and statistical modeling.

Necessary prerequisites

1st year linear algebra and analysis, programming in Python language

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