

Mathematics tools (elective course)

Introducing

Description

Detailed Programme:

Topology

1. Sequences in a normed vector space (NVS)
2. Topology: open and closed sets, closure, density
3. Limits, continuity of functions, compactness (Bolzano) and Heine theorems
4. Linear maps between NVS: continuity, operator norms

Numerical Analysis

1. Concept of numerical error, floating-point number representation
2. LU and Cholesky factorization, matrix conditioning
3. Singular Value Decomposition (SVD)
4. Least squares solutions to $Ax=b$, QR factorization
5. Power method
6. Newton's method for solving $F(X)=0$
7. Fixed-point method (lab work)
8. Numerical integration
9. Gradient method

Probability and Statistics

- Multidimensional random variables, conditional distributions, and independence

- 2_1: Master the fundamental tools of the mathematical engineer.

(Based on the CTI Competency Framework, 2019)

Necessary prerequisites

- Working with sets, computing sums and numerical series, derivatives, integrals (single and multiple), improper integrals, equivalent expressions, and limits
- Programming in Python

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

Objectives

List of Competencies:

- 1_1: Master mathematical concepts and computational tools relevant to engineering.
- 1_2: Develop rigorous scientific reasoning and abstraction skills.