Mathematics 1A

** General information **

- Course name in French: Mathématiques 1A
- ECTS credits: 5
- Level : Undergraduate (Bachelor 3rd year)
- Teaching hours: 96 hours (Lectures = 36 hours, Tutorials = 36 hours, Self-study = 24 hours)
- Language of instruction: French
- Coordinator: Jacques Liandrat
- Instructor(s): Jacques Liandrat, Guillaume Chiavassa, Mitra Fouladirad, Frédéric Schwander, Jean-Marie Rossi, Thibaut Le Gouic, Chiheb Daaloul, Emmanuelle Sarrouy, Christophe Pouet
- Last update 18/02/2022 by C. Pouet

** This course unit is offered twice a year. ** Students can attend this course during

- Fall-Winter Semester: from early September until end of January/early February
- Spring Semester: from early February until end of June

Brief description

This course is a basic course in Mathematics for any student in engineering. It is divided into three equal parts:

- Mathematical analysis (Analyse théorique in French)
- Numerical analysis (Analyse numérique in French)
- Probability and statistics (Probabilités et statistique in French)

Learning outcomes

- tba

Prerequisites

- Undergraduate level in
  - Mathematical analysis: Riemann integral, change of variable, derivatives, limits, sequences
  - Linear algebra: vector, matrix, vector space, scalar product, determinant, matrix diagonalization, change of basis

Assessment

- Final exam: 50%
- Continuous assessment: 50% (project, quiz, lab report)

Course content

1. Mathematical analysis
    - Differential calculus
    - Optimization
    - Lebesgue integral
    - Fourier transform and Fourier series
    - Hilbert spaces
2. Numerical analysis
    - tba
3. Probability and Statistics
    - Sigma-algebra, probability measure
    - Real random variables (discrete and continuous)
    - Expectation, variance
    - Random vector, covariance, variance matrix
    - Independence
    - Strong and weak law of large numbers
    - Central Limit Theorem
    - Introduction to statistics: statistical experiment, quadratic risk, bias, pointwise estimation, Maximum Likelihood Method, confidence interval

Bibliography

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Last update: **2022/04/08 14:57**