Summary
This course teaches the students practical skills needed for solving modern physics problems by means of computation. A number of examples illustrate the utility of numerical computations in various domains of physics.

Content
**Fourier series and transforms** Introduction to the Fourier series and transforms and their application. Mathematical properties: convergence, convolution, correlation, Gibbs phenomenon and the Wiener-Khinchin theorem. Fourier transform on discrete sampled data: aliasing and sampling theorem. Discrete Fourier transform (DFT) and fast Fourier transform (FFT). Applications: spectral analysis, filters. Fourier transforms in higher dimensionality.


Learning Prerequisites
**Recommended courses**
1st and 2nd years numerical physics courses

Learning Outcomes
By the end of the course, the student must be able to:
- Choose the most suitable algorithm for solving given problem
- Integrate algorithms in computer codes and evaluate their performance
- Solve actual physics problems using numerical tools

Teaching methods
Ex cathedra presentations, exercises and work under supervision

Assessment methods
3 reports during the semester
Resources

Bibliography
J. F. James, A Student's guide to Fourier transforms, CUP 2011

Ressources en bibliothèque
- Numerical linear algebra / Trefethen
- A Student's guide to Fourier transforms / James