Calcul différentiel et intégral II

Lecturers
Antoine GLORIA (Coordinator) and Guillaume DUJARDIN

Course mnemonic
MATH-F201

ECTS credits
10 credits

Language(s) of instruction
French

Course period
First and second terms

Course content

1 Function spaces and convergences
- Convergence of sequences and series of functions (simple, absolute, uniform, normal)
- Derivability of sums of series of functions
- Converging and absolutely converging integrals
- Derivation of functions defined by integrals
- Regularization by convolution
- Ordinary differential equations
- Differential equations and systems
- Banach fixed point theorem
- Local and global Cauchy-Lipschitz theorem
- Structure of the solution space of a linear system
- Resolvent and exponential of a matrix
- Gronwall lemma
- Fourier series
- Definition: real and complex formulation
- Bessel inequality
- Riemann-Lebesgue theorem
- Dirichlet theorem
- Parseval-Plancherel theorem
- Fonction of the complex variable
- Derivability and Cauchy-Riemann equation
- Fondamental theorem of holomorphic functions
- Cauchy theorem
- Taylor and Laurent series expansion
- Residual theorem

Objectives (and/or specific learning outcomes)

The main concepts of the course are:
- different notions of convergence in infinite-dimensional spaces
- differential equations and systems, their structure, and what they model
- Fourier analysis
- Derivability of functions of the complex variable

Pre-requisits and co-requisits

Pre-requisites courses

MATH-F101 | Calcul différentiel et intégral I | 15 crédits

Courses having this one as pre-requisit

MATH-F3001 | Théorie de la mesure | 5 crédits, MATH-F314 | Mathématiques pour la physique | 10 crédits and MATH-F3142 | Introduction aux équations aux dérivées partielles | 5 crédits

Course having this one as co-requisit

MATH-F310 | Differential geometry I | 5 crédits

Teaching method and learning activities

Blackboard lectures

Exercise classes

Contribution to the teaching profile

This is the second part of a large course in differential and integral calculus calculus, which introduces fundamental concepts of mathematical analysis and its applications to physics.

References, bibliography and recommended reading

Courant R. and John F. 1989 : Introduction to calculus and analysis. Springer, New York . Rudin W. : 1976. Principles of mathematical analysis. Mc Graw Hill

Other information

Contact(s)

Guillaume Dujardin (guillaume.dujardi@inria.fr) and Antoine Gloria (agloria@ulb.ac.be)

Evaluation method(s)

Other

Evaluation method(s) (additional information)

Two written exams

Two personal works

Determination of the mark (including the weighting of partial marks)

Arithmetic average of the two exams (plus bonus from personal work).

Main language(s) of evaluation

French

Programmes

Programmes proposing this course at the faculty of Sciences

BA-MATH | Bachelor in Mathematics | unit 2 and BA-PHYS | Bachelor in Physics | unit 2