MATH-515

Topics in calculus of variations

Cursus	Sem.	Type
Ing.-math	MA1, MA3	Opt.
Mathématicien	MA1, MA3	Opt.

Language of teaching	English
Credits	5
Session	Winter
Semester	Fall
Exam	Oral
Workload	150h
Weeks	14
Hours	**4 weekly**
Lecture	2 weekly
Exercises	2 weekly
Number of positions	

Remark

pas donné en 2023-24

Summary

Introduction to classical Calculus of Variations and a selection of modern techniques.

Content

- Classic functionals in the Calculus of Variations
- Semi-direct methods
- Direct method in Calculus of Variations
- Functionals in Sobolev spaces, convexity, lower semicontinuity, existence and regularity
- If time allows: Plateau's problem, Gamma-convergence, isoperimetric problem

Keywords

calculus of variations, optimization, minimization, Euler-Lagrange equations, first variation, direct method, Lagrangian, convexity, lower semicontinuity.

Learning Prerequisites

Required courses

- MATH-200: Analysis III
- MATH-205: Analysis IV
- MATH-303: Measure and integration

Recommended courses

- MATH-301: Ordinary differential equations
- MATH-302: Functional analysis I
- MATH-305: Sobolev spaces and elliptic equations

- MATH-437: Calculus of Variatinos

Learning Outcomes

By the end of the course, the student must be able to:

- Demonstrate proficiency in statements
- Identify use and role of the assumptions
- Recognize which concepts and results could be used in a given context
- Describe concepts and proofs
- Apply theory for specific examples

Teaching methods

Lectures + Exercises

Assessment methods

Oral
Dans le cas de l'art. 3 al. 5 du Règlement de section, l'enseignant décide de la forme de l'examen qu'il communique aux étudiants concernés.

Supervision

Assistants Yes

Resources

Bibliography

"*Introduction to the Calculus of Variations*", B. Dacorogna
"*Direct Methods in Calculus of Variations*", B. Dacorogna
"*Calculus of Variations*", J. Jost & X. Li-Jost
"*One-dimensional Variational Problems*", G. Buttazzo & M. Giaquinta & S. Hildebrandt
"*Introduction to the Modern Calculus of Variations*", F. Rindler
"*Sets of Finite Perimeter and Geometric Variational Prob- lems: An Introduction to Geometric Measure Theory*", F. Maggi
"*Measure Theory and Fine Properties of Functions*", L.C. Evans & R.F. Gariepy

Ressources en bibliothèque

- One-dimensional Variational Problems / Buttazzo
- Introduction to the Calculus of Variations / Dacorogna
- Calculus of Variations / Jost
- Direct Methods in Calculus of Variations / Dacorogna
- Introduction to the Modern Calculus of Variations / Rindler
- Sets of Finite Perimeter and Geometric Variational Prob- lems: An Introduction to Geometric Measure Theory / Maggi
- Measure Theory and Fine Properties of Functions / Evans