

MATH-604

**Some Aspects of Calculus of Variations**

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Cursus	Sem.	Type
Mathematics		Opt.

Language of teaching	English
Credits	3
Session	
Exam	Oral presentation
Workload	90h
<b>Hours</b>	<b>56</b>
Courses	28
TP	28
<b>Number of positions</b>	

**Frequency**

Only this year

**Remark**

Fall semester - Tuesdays 2 - 4pm - online. Exam session on Thursday January 14th from 9h15 to 13h15 by ZOOM

**Summary**

The goal of this course is to present an overview on the solvability and the regularity of relevant models of physical, technological and economical systems, which may be formulated as minimization problems of suitable integral functionals.

**Content**

The aim of this course is to give an introduction to the classical and modern calculus of variations with a focus on the theory of integral functionals defined on spaces of vector-valued maps in several variables. This is due to the fact that many physical, technological and economical systems incorporate some kind of variational principle, and the understanding of this structure is essential to obtain meaningful results about them. We will discuss topics as the Direct Method in Calculus of Variations, and the main assumptions that allows for a solid existence and regularity theory of such vector-valued problems. If the time allows, we will also cover some aspects of variational convergence of functionals ( $\Gamma$  convergence).

**Keywords**

Direct method, Euler Lagrange equations, lowersemicontinuity, convexity

**Learning Prerequisites****Required courses**

Basic courses of analysis and Functional analysis

**Learning Outcomes**

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

- understand when it is possible to apply and how to use the Direct method of calculus of variations, describe the eventual obstacles and how to overcome them

**Resources****Websites**

- <https://moodle.epfl.ch/course/view.php?id=16248>