Multidimensional Calculus of Variations

Winter Term 2019/20

Alexander Mielke

Lecture times:
Wednesday 9:15–10:45 h, Rudower Chaussee 25 (JvN), Room 3.008
Thursday 13:15–14:45 h, Rudower Chaussee 25 (JvN), Room 1.013

Exercise Group:
Thursday 9:15–10:45 h, Rudower Chaussee 25 (JvN), Room 1.115

`http://www.wias-berlin.de/people/mielke/teaching.jsp`

Office hours:
Thursday 11:00-11:30 h at Room 2.104 (RUD 25 JvN)
and after special arrangement (via phone/e-mail) at WIAS

Prerequisites: Analysis I–III, Linear Algebra I–II, Functional Analysis
[desirable, but not necessary: Partial Differential Equations]

Planned Topics (according to module description):

Classical Calculus of Variations: Functionals on functionals spaces, Euler-Lagrange equations, critical points, local and global minimizers, necessary and sufficient conditions for weak and strong local extrema.

Modern Calculus of Variations: Direct method of the calculus of variations, existence of global minimizers using weak lower semicontinuity and coercivity. Existence of minimizers in Sobolev spaces. Extrema under constraints, eigenvalue characterization. Convexity and subdifferentials, general notions of convexity (ank-one convexity, quasiconvexity, polyconvexity), nonlinear elasticity, Gamma convergence for functionals.

Literature

Functional analytic foundations: [Alt85]
Central basic works: [EkT76, Dac89, Dac04, Rin18]

[Alt85] H. W. Alt. *Lineare Funktionalanalysis*. Springer-Verlag, Berlin, 1985.

[Dac89] B. Dacorogna. *Direct Methods in the Calculus of Variations*. Springer 1989.

[Dac04] B. Dacorogna. *Introduction to the calculus of variations*. Imperial College Press, London, 2004.

[EkT76] I. Ekeland and R. Temam. *Convex Analysis and Variational Problems*. North Holland, 1976.

[Rin18] F. Rindler. *Calculus of Variations*. Springer, 2018.