Multidimensional Calculus of Variations
Winter Term 2015/16
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Multidimensional Calculus of Variations

Lecture times:
Thursday 9:15–10:45 h, Rudower Chaussee 25, Hörsaal 75, (Raum 1.115)
13:15–14:45 h, Rudower Chaussee 26, Hörsaal 0307

Exercises:
Tuesday 13:15–14:45 h, Rudower Chaussee 25, Seminarraum 20 (Raum 1.012)
Starting Date: Tuesday, October 20, 2015
Course Materials: www.wias-berlin.de/people/mielke/teaching.jsp

Office hours:
Thursday 11:00-12:00 h at Room 2.104 (RUD 25)
and after special arrangement (via phone/e-mail) at WIAS.

Preliminary dates for final exam (oral): March 2/3 and April 7/8 2016.

Suggested prerequisites for taking the final exam: 50% points from written take-home exercises and 50% points in the written test (2nd last week of term).

Prerequisites:

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

Planned Topics (according to module description):

Classical Calculus of Variations: Euler-Lagrange equations, necessary and sufficient conditions for weak and strong local extrema.

Modern Calculus of Variations: Existence of global minimizers using the direct method via weak convergence in Sobolev spaces, Lax–Milgram theorem. Rank-one, quasi, and polyconvexity. Extrema under constraints, eigenvalue characterization. Nonlinear elasticity.

Literature:

Functional analysis: [Alt85]
Introductory material: [EkT76, Dac89, Tro96, Dac04]

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

[Dac89] B. Dacorogna. *Direct Methods in the Calculus of Variations*. Springer-Verlag, Berlin, 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.

[Tro96] J. L. Troutman. *Variational calculus and optimal control*. Undergraduate Texts in Mathematics. Springer-Verlag, New York, 1996.