UNIVERSITÀ DI PAVIA

Anno Accademico 2016/2017

CALCULUS OF VARIATIONS

Enrollment year	2016/2017
Academic year	2016/2017
Regulations	DM270
Academic discipline	MAT/05 (MATHEMATICAL ANALYSIS)
Department	DEPARTMENT OF MATHEMATICS "FELICE CASORATI"
Course	MATHEMATICS
Curriculum	PERCORSO COMUNE
Year of study	1°
Period	1st semester (03/10/2016 - 13/01/2017)
ECTS	6
Lesson hours	48 lesson hours
Language	Italian
Activity type	ORAL TEST
Teacher	MORA MARIA GIOVANNA (titolare) - 6 ECTS
Prerequisites	Basic knowledge of Functional Analysis and Measure Theory (the main definitions and results will be given during the course).
Learning outcomes	The course aims at giving an introduction to the Calculus of Variations.
Course contents	Direct method of the Calculus of Variations. Lower semicontinuous functions: sequential and topological definition; properties. Coercive and sequentially coercive functions. Convex functions: domain, epigraph, properties. Lower semicontinuous envelope, convex envelope. Integral functionals on Lebesgue spaces: lower semicontinuity with respect to strong and weak topologies. Nemytskii operators. Riemann-Lebesgue Lemma. Convexity as a necessary and sufficient condition for weak lower semicontinuity. Sobolev spaces. Integral functionals on Sobolev spaces: lower semicontinuity with respect to strong and weak topologies. Quasi-convexity, policonvexity and rank-one convexity. Quasi-convexity as a necessary and sufficient condition for weak lower semicontinuity.

	Relaxation. Fréchet and Gâteaux differentiability. Euler-Lagrange equation. Du Bois-Reymond equation. Regularity results for one-dimensional problems. Gamma-convergence: the fundamental theorem, stability with respect to continuous perturbations, connections with uniform and pointwise convergence, lower semicontinuity of Gamma-limits, relaxation, examples, and applications.
Teaching methods	Lectures
Reccomended or required readings	G. Buttazzo, M. Giaquinta, S. HIldebrandt One-dimensional Variational Problems, An Introduction Oxford University Press, 1998 B. Dacorogna Direct Methods in the Calculus of Variations Springer 2002, 2nd edition A. Braides Gamma-convergence for beginners Oxford University Press, 2002
Assessment methods	Oral exam.
Further information	Oral exam.
Sustainable development goals - Agenda 2030	$lbl_legenda_sviluppo_sostenibile