



CALCULUS OF VARIATIONS

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| Enrollment year | 2015/2016 |
| 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 | 2° |
| 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. |

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| | 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 | <p>G. Buttazzo, M. Giaquinta, S. Hildebrandt One-dimensional Variational Problems, An Introduction Oxford University Press, 1998</p> <p>B. Dacorogna Direct Methods in the Calculus of Variations Springer 2002, 2nd edition</p> <p>A. Braides Gamma-convergence for beginners Oxford University Press, 2002</p> |
| Assessment methods | Oral exam. |
| Further information | Oral exam. |
| Sustainable development goals - Agenda 2030 | \$lbl legenda sviluppo sostenibile |