Calculus of Variations with applications to Materials Science

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Timetable: 12 hrs. First lecture on June 23, 2014, 16:30 (dates already fixed, see the calendar) Torre Archimede, Room 2BC/30.

Course requirements: Calculus, Basic functional analysis

Examination and grading: a brief discussion

SSD: MAT/05

Aim: An introduction to the field of the Calculus of Variations, keeping an eye to applications

Course contents:

1. Some classical problems of the Calculus of Variations
2. Preliminaries: Sobolev spaces, convex Analysis, weak topologies...
3. Classical methods: the first variation and the Euler-Lagrange equation
4. Direct methods: Scalar and vectorial case, quasi–convexity, polyconvexity
5. Relaxation: non convex functionals
6. Gamma - convergence: Cahn-Hilliard's method for the phase transition
7. Continuum mechanics and elasticity: finite and linear elasticity theory, existence problems and deduction of the Gamma convergence.
8. Thin structures: Biological membranes and adhesion problems