Functional analysis and variational methods: a course in analysis, optimization, calculus of variations, and optimal control

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Timetable: 24 hrs. Lectures on May/June 2012 (see the calendar), Room 2BC/30, Torre Archimede. Possible small changes in the timetable will be communicated at the beginning of the course.

Course requirements:

Examination and grading: Seminar on a subject assigned by one of the Instructors

SSD: MAT/05

Aim: This course presents some modern tools for treating nonlinear problems in optimization and control. These include nonsmooth calculus, viscosity solutions, and discontinuous feedback. The need for such tools will be motivated, and applications will be made to central issues in the calculus of variations, and in both optimal and stabilizing control.

Course contents:

Specific topics for the dozen lectures include:

1. Dynamic optimization: from the calculus of variations to the Pontryagin Maximum Principle
2. Some constructs of nonsmooth analysis and geometry, and why we need them
3. Applications to optimization
4. Lyapunov functions and controllability, classical to modern
5. Discontinuous feedback for stabilization
6. Sliding modes and hybrid systems