**Min-Max methods in the variations of curves and surfaces**

The study of the variations of curvature functionals takes its origins in the works of Euler and Bernouilli from the XVIIIth century on the Elastica. Since these very early times, special curves and surfaces such as geodesics, minimal surfaces, elastica, Willmore surfaces...etc have become central objects in mathematics much beyond the field of geometry *stricto sensu*with applications in analysis, in applied mathematics, in theoretical physics and natural sciences in general.

Despite its venerable age the calculus of variations of length, area or curvature functionals for curves and surfaces is still a very active field of research with important developments that took place in the last decades.

In the proposed mini-course we shall concentrate on the various *minmax*constructions of these critical curves and surfaces in euclidian space or closed manifolds.

We will start by recalling the origins of minmax methods for the length

functional and present in particular the ``curve shortening process'' of Birkhoff. We will mention the generalization of Birkhoff's approach to surfaces and the ``harmonic map replacement'' method by Colding and Minicozzi.

We will then recall some fundamental notions of Palais Smale deformation theory in infinite dimensional spaces and apply it to the construction of closed geodesics and Elastica.

In the second part of the mini-course we will  present a new method based on smoothing arguments combined with Palais Smale deformation theory for performing successful minmax procedures for surfaces. We will present various applications of this so called ``viscosity method'' such as the problem of computing the cost of the sphere eversion in 3 dimensional euclidian space.