

**MATH 602D**  
**VARIATIONAL METHODS IN GEOMETRY**

Spring 2020

**Time:** Tuesday and Thursday 11:00 - 12:30 in MATH 225

**Course Description:**

Geometric variational problems have been studied by mathematicians for more than two centuries. The theory of minimal submanifolds, for instance, was initiated by Lagrange in 1760. Minimization principles have been extremely useful in the solution of various questions in analysis, geometry, and topology. Most recently, and remarkably, minimax principles and unstable critical points have given us new tools and played a key role in the solution of old problems such as in the proof of the Poincaré Conjecture by Perelman (2006), the proof of the Willmore Conjecture by Marques and Neves (2012), and the proof of Yau's Conjecture by A. Song (2018).

This course will offer an introduction to minimal submanifolds and related variational problems. Topics covered include: first and second variation of volume, Morse index and stability, Plateau problem, applications to curvature and topology, extremal eigenvalue problems, harmonic maps, min-max theory and recent developments.

**Reference:** *A course in minimal surfaces* by Colding and Minicozzi

[*Note:* Other references will be provided throughout the term.]

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