

GEOMETRIC MEASURE THEORY

T. TORO

WINTER 2018 - MATH 582

Geometric Measure Theory (GMT) is a classical subject in geometric analysis which in recent years has seen a new revival. Tools introduced to study perimeter minimizers and minimizing surfaces have found applications in areas such as metric geometry, harmonic analysis, free boundary problems and theoretical computer sciences. The goal of this three quarter sequence is to introduce the subject (Math 581), present the theory of perimeter minimizers and *almost* minimizers (Math 582) and then discuss some its recent applications (Math 583).

The aim of the second quarter of this course is to study the structure of sets of locally finite perimeter, and discuss the regularity of the boundary of those sets of finite perimeters which arise as minimizers (and almost minimizers) in variational problems.

- Sets of Finite Perimeter
 - Definitions, Structure Theorem
 - Isoperimetric Inequalities
 - The Reduced Boundary
 - Gauss-Green Theorem
 - Criterion for Finite Perimeter
- Approximation by C^1 Functions
 - Convex Functions
 - Whitney's Extension Theorem
- First and second variations of perimeter
 - First variation of perimeter and means curvature
 - Stationary sets and monotonicity of density ratios
 - Volume-constrained perimeter minimizers
 - Second variation of perimeter
- Anisotropic surface energies

References:

- [AFP] Functions of Bounded Variation and Free Discontinuity Problems, L. Ambrosio, N. Fusco & D. Pallara.
- [EG] Measure Theory and Fine Properties of Functions, Revised Edition, L. C. Evans & R. F. Gariepy
- [G] Minimal Surfaces and Functions of Bounded Variations, E. Giusti.
- [M1] **Sets of Finite Perimeter and Geometric Variational Problems, F. Maggi.**
- [M2] Geometry of sets and measures in Euclidean spaces : fractals and rectifiability, P. Mattila.
- [S] Lectures on geometric measure theory, L.M. Simon.

Instructor Information:

Instructor: Tatiana Toro

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Office hours: Wednesday 2-3 or by appointment.

Class schedule: Monday - Wednesday 9:00-10:20. Some Fridays 9:00-10:20.

Prerequisites: Real Analysis or instructors approval.