

# Topics in Geometric Measure Theory

Math 581

Fall 2021

## INSTRUCTOR INFORMATION:

Instructor: Tatiana Toro

Class meetings: MW 11:30-12:50 - MUE 155

**Zoom** link posted on [canvas](#) (registration required)

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Course website [here](#).

Office hours: by appointment.

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. This course will be a continuation of the Introduction to Geometric Measure Theory course taught in the Spring of 2021 by the same instructor. The goal is to discuss the following topics.

The goal is to cover the following topics:

- Sets of Finite Perimeter
  - Existence of Perimeter minimizers (brief review)
  - The Reduced Boundary and DeGiorgi's structure theorem ([M1] chapter 15)
  - Federer's theorem and comparisons sets ([M1] chapter 16)
  - Boundary decomposition for sets of locally finite perimeter with density bounds ([BEGTZ] section 3 & appendix A)
- First and second variation of perimeter ([M1] chapter 17)
- Anisotropic surface energies([M1] chapter 20)
- Theory of varifolds: Monotonicity formula & applications ([S] chapter 4)

## REFERENCES:

- [BEGTZ] Two Phase Free Boundary Problem for Poisson Kernels, S. Bortz, M. Engelstein, M. Goering, T. Toro & Z. Zhao, ([Section 3, Appendix A](#))
- [EG] Measure Theory and Fine Properties of Functions, Revised Edition, L. C. Evans & R. F. Gariepy
- [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.

**Course structure:** This term we will use a mixture of learning/teaching modalities. Student will have access to the lecture notes. Students will be asked to read on the subject matter before class and come prepared with questions. The goal is to meet mostly in person, but we should be prepared to meet virtually if necessary. To address this a zoom link has been created and it is available through canvas. Please refrain from sharing it with people who are not registered for the course.

**Grading Policy:** This is a topics course so the grade will be determined by involvement and participation. Problems will be suggested and students will be encouraged to attempt them. Some of them will be discussed in class others in additional sessions. The grade will be based on students participation.

**Technology:** A zoom link will be created for this class. It is to be used if we need to have virtual lectures or for office hours. The zoom link will be available through Canvas. You can download UW zoom [here](#).

**Religious Accommodations:** Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW's policy, including more information about how to request an accommodation, is available at [Religious Accommodations Policy](#) . Accommodations must be requested within the first two weeks of this course using the [Religious Accommodations Request form](#) .

**The UW Food Pantry:** A student should never have to make the choice between buying food or textbooks. The UW Food Pantry helps mitigate the social and academic effects of campus food insecurity. They aim to lessen the financial burden of purchasing food by providing students with access to food and hygiene products at no-cost. Students can expect to receive 4 to 5 days' worth of supplemental food support when they visit the Pantry. For information including operating hours, location, and additional food support resources visit [The UW Food Pantry](#). They can be found on the North side of West Campus' Poplar Hall at the corner of Brooklyn Ave NE and 41st.