In this course we will introduce the concepts of Hausdorff measures and dimensions. These “lower dimensional” measures allow to measure certain “very small” sets, and arise naturally in variational calculus, geometric analysis, harmonic analysis, PDE and potential theory. We will start by reviewing covering lemmas and differentiation. We will then define Hausdorff measures and dimensions, study their properties and typical examples. We will discuss Lipschitz mappings, jacobians, and differentiability. Then we will prove the area and co-area formulas (generalized “change of variables” formulas) for Lipschitz mappings. These formulas are basic and powerful tools that involve Hausdorff measures.

**Prerequisites:** Math 822 - Real Analysis.

**Text:** No text will be required.

**We will use the following references (in this order):**


