PRELIMINARY SYLLABUS FOR SPRING 2027 MATH GR6308: ALGEBRAIC TOPOLOGY II

FRANCESCO LIN

Schedule. MW 2:40-3:55PM.

Office hours. TBA.

Contents. This is the second part of the Graduate Algebraic Topology sequence. It will roughly consists of following three parts:

(1) The Serre spectral sequence and its applications.
(2) Vector bundles and characteristic classes.
(3) The Atiyah-Singer index theorem.

While most of the class will follow a traditional advanced algebraic topology sequence style (with a focus on concrete computations), the last part will be more similar in spirit to a topics class.

Assessment. Written exam on Parts (1) and (2), plus oral presentation on an advanced topic. I will post sample exercises and a list of suggested topics as the semester progresses.

Prerequisites. MATH GR6307: Algebraic topology I from Fall 2026, and basic notions of smooth manifolds and Riemannian geometry. The last part of the class might require some basic familiarity in functional analysis.

Materials. I will post the handwritten notes I use in class.

References. We will mostly follow these books:

- Milnor - Characteristic classes.
- Davis, Kirk - Lecture notes in Algebraic topology.
- Fuchs, Fomenko - Homotopical topology.
- Hatcher - Vector bundles and K-theory.
- Shanahan - The Atiyah-Singer index theorem.