**Course Title:** Motives at $p$

**Instructor:** Elden Elmanto, TBD, elmanto@math.harvard.edu

**Office Hours:** TBD

**What is this class about?** This course will survey the state-of-the-art on the theory of motives, motivic cohomology and algebraic K-theory for p-adic rings and schemes with p-adic coefficients. Topics include: the (logarithmic) de-Rham witt complexes (sheaves), the Geisser-Levine theorem and mod-p algebraic cycles, trace methods and topological cyclic homology, derived algebraic geometry methods, and prismatic methods. We will focus on examples and applications. Original results presented are all joint with Matthew Morrow.

**Approximate syllabus**

1. Deligne-Illusie's Hodge-to-de Rham degeneration via characteristic $p > 0$ methods.

2. Milnor $K$-theory and algebraic $K$-theory; connections with algebraic cycles and differential forms (Bloch-Kato-Gabber).

3. Crystalline cohomology and the de Rham Witt complex; connections with $K$-theory (Bloch; Hesselholt-Madsen).

4. The Geisser-Levine theorem.

5. Topological cyclic homology and the Clausen-Mathew-Morrow theorem.

6. Motivic cohomology, as reconstructed by the instructor and Morrow.

**Key dates**

09/05  Labor day.

10/10  Indigenous People's Day

**Grading**: Participants requiring a grade should consult the instructor