Abstract: An elliptic cohomology is a generalized cohomology theory which encodes the group structure of an elliptic curve into its characteristic classes. This notion was inspired by the Witten genus for string manifolds which takes values in the ring of integral modular forms of level 1. It has found applications and connections to internal questions in algebraic topology, such as computations of the stable homotopy groups of spheres, as well as to differential topology, mathematical physics, and derived algebraic geometry.

In this talk, I will discuss an aspect of the theory that ties its cohomology operations to arithmetic moduli of elliptic curves in a precise way. In particular, I’ll present an integral model for the modular curve X\_0(p) over the ring of integers of a sufficiently ramified extension of Z\_p whose special fiber is a semistable curve in the sense that its only singularities are normal crossings. This leads to an explicit algebra of power operations for the elliptic cohomology, which has applications to unstable chromatic homotopy theory, and which further packages into certain Hecke operators, with connections to quasimodular forms and refinements of the Witten genus.