1125-AB-672 **Catherine M Hsu*** (cathyh@uoregon.edu), University of Oregon, Fenton Hall, Eugene, OR 97403. *Higher Eisenstein Congruences.*

In this talk, we aim to determine "depths" of congruences between weight 2 newforms and certain Eisenstein series in order to gain information about the structure of the associated Hecke algebra. Indeed, for any squarefree N with an odd number of prime factors, we consider the Eisenstein series of weight 2 and level N given by

$$E_{2,N}(z) = \sum_{d|N} \mu(d) d E_2(dz),$$

where μ is the Möbius function and E_2 is the weight 2 Eisenstein series for $\mathrm{SL}(2,\mathbb{Z})$ normalized so that the Fourier coefficient of q is 1. A recent result of Martin states that if p divides the numerator of $\frac{\varphi(N)}{24}$, then there exists a newform $f \in S_2(\Gamma_0(N))$ congruent to $E_{2,N}$ modulo p; we wish to refine this result by computing the depths of all congruences between newforms of level M dividing N and $E_{2,N}$. In particular, because of the close relationship between congruences modulo p of newforms and completions of the Hecke algebra at certain maximal ideals, our computations, combined with a commutative algebra result of Berger, Klosin, and Kramer, will give us an upperbound for the p-adic valuation of index of the Eisenstein ideal in the Hecke algebra. This work is currently in progress and partially joint with Krzysztof Klosin. (Received September 20, 2016)