

Course Title: Modular Forms and Arithmetic

Course #: 87100

Time and Location: Tuesday 2pm - 4pm

Instructor Name: Krzysztof Klosin

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Pre-Requisites: 2 semesters of algebra

Office Hours: Tuesday 12-2

Description:

Wiles' proof of the Taniyama-Shimura Conjecture (and as a consequence Fermat's Last Theorem), many constructions of non-trivial elements in class groups of number fields (and more generally, the so-called Main Conjecture(s) of Iwasawa Theory), the Sato-Tate Conjecture for elliptic curves are just a few examples of fundamental results in number theory that were proven in the last 45 years using modular forms. Interesting in their own right, these holomorphic functions on the complex upper half-plane satisfying some symmetries (and their higher rank generalizations), are now one of the most active areas of research. The goal of this course will be to introduce modular forms with a focus on their arithmetic properties and some of their applications to proving results of the type mentioned above. More specifically, topics to be covered in the class include: Basic definitions of modular forms, Eisenstein series and cusp forms for congruence subgroups, Hecke operators, L-functions and the theory of newforms, the Eichler-Shimura isomorphism, Galois representations attached to modular forms, the Herbrand-Ribet Theorem. Other topics may be added if time permits. No previous background in modular forms is necessary.