MATH 613E: TOPICS IN NUMBER THEORY
ELLIPTIC CURVES AND ARITHMETIC

Instructor:
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Timings: Tuesdays and Thursdays: 2- 3:30 p.m.; CEME 1210
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Course Page: https://canvas.ubc.ca/courses/156661
Office Hours: Wednesdays 11 a.m. - 1 p.m., by appointment

Course Outline:

Elliptic curves are important objects and their study straddles different areas such as topology, algebraic topology and arithmetic. However some of the deepest problems related to elliptic curves occur in Number Theory. In this course, we shall explain one such, namely the Birch and Swinnerton-Dyer Conjecture, which was formulated in the early 1960's. The strong version of this conjecture predicts an exact formula that involves different, mysterious objects occurring in the study of elliptic curves and we will explain the terms occurring in this formula. The process of acquainting oneself with these terms will lead us to a deeper study of the theory of elliptic curves itself. We shall also present what is known about this conjecture.

Regular reading and working through proofs from the lectures, and solving problems in the assignments are expected from the students. Students are expected to participate by asking questions in class when they do not understand the material. Students are expected to fully understand the solutions to the exercises that they provide.

Students are permitted to use artificial intelligence tools, including generative AI, to gather information, review concepts or to help produce assignments. However, students are ultimately accountable for the work they submit, and any content generated or supported by an artificial intelligence tool must be cited appropriately. Use of AI tools is not permitted during midterm exams and final exams in this course.

There will be no final exam for this course. I will try to make the course as self-contained as possible, pointing to further readings as the course progresses. Students will be assigned topics during the course on which they are expected to give a seminar style lecture.

Reference: The main reference will be the classic book *Arithmetic of Elliptic curves* by J.H. Silverman and the notes by J.S. Milne, {https://www.jmilne.org/math/Books/ectext6.pdf}.