Instructor: Dr. Anthony Várilly-Alvarado  Time: TuTh 1:00-2:15PM
Office: 412 Herman Brown  Classroom: Herzstein 212
Email: varilly@rice.edu  Office Hours: M 2:00-3:00PM, Th 2:15-3:15PM
Class Webpage: Look for Math 373 001 F10 on Owlspace.

Teaching Assistant: The teaching assistant for this course is Zhiyuan Li. His office is HB 447 and he will have an office hour/TA session on Mondays (time and location TBA.)

Text: Rational Points on Elliptic Curves, Joseph H. Silverman and John Tate.

Homework: Due once a week, in class, on Tuesdays. This is a very important component of the course. You should expect to spend a significant amount of time doing homework.

The homework is not pledged and you can collaborate with other students in the class. In fact, you are very much encouraged to do so. You should write up your solutions individually (in particular, you should not be looking at other people’s write-ups while writing your own).

Exams: There will be an in-class midterm exam, on October 14th. There will also be an in-class Final Exam, during the Fall Exam Period. The date of this exam is yet to be determined by the Registrar’s Office.

Warning: It is the policy of the Mathematics Department that no final may be given early to accommodate student travel plans. If you make travel plans that later turn out to conflict with the scheduled exam, then it is your responsibility to either reschedule your travel plans or take a zero in the final.

If an exam conflicts with a holiday you observe, please let me know.

Grades: Homework will count for 40% of your final grade. The midterm will count for 20% of your grade and the final exam will count for 40% of your grade.

Expectations: In my experience as a student, most people do not follow all the details of a Math lecture in real time. During lecture, you should expect to witness the big picture of what’s going on. You should pay attention to the lecturer’s advice on what is important and what isn’t. A lecturer spends a long time thinking on how to deliver a presentation of an immense amount of material; they do not expect you to follow every step, but they do expect you to go home and fill in the gaps in your understanding. Not attending lecture really hurts your chances at a deep understanding of the material.

Disability Support: Any student with a documented disability seeking academic adjustments or accommodations is requested to speak with me during the first two weeks of class. All such discussions will remain as confidential as possible. Students with disabilities will need to also contact Disability Support Services in the Allen Center.
**Topics to be covered**

1. **Projective Geometry:** Curves on the projective plane; intersections and Bezout’s Theorem.

2. **Geometry of Elliptic curves:** Weierstrass normal form. The group law on an elliptic curve.

3. **Points of Finite order:** The Nagell-Lutz Theorem.

4. **Descent:** Heights. The Mordell-Weil Theorem.

5. **Factorization:** Elliptic curves over finite fields. Factoring integers using elliptic curves.

6. **The Birch–Swinnerton-Dyer conjecture:** The zeta function of an elliptic curve. Analytic rank and the BSD conjecture. (This is one of the seven millenium problems sponsored by the Clay Mathematics Institute; there’s a $1$ million bounty on it).

7. **Codes on curves:** (Time permitting) Error-correcting codes and elliptic curves.

I will introduce (or remind you) about some algebraic structures (like, groups, rings, fields, ideals) as we go along.