

**Mathematics 788E, Introduction to the Arithmetic of Elliptic Curves.
Fall 2008.**

Instructor: Matthew Boylan.
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Office hours: Mon. 1 - 2, Weds. 9 - 10, Thurs. 9:30 - 10:30, and by appointment.

• **Course Webpage:**

<http://www.math.sc.edu/~boylan/SCCourses/math788E/788E.html>

• **Prerequisite:** 700, 701, 703, 704 or consent of instructor.

• **Text:** Knapp, Anthony W. Elliptic Curves. Mathematical Notes, 40. Princeton University Press, Princeton, NJ, 1992. xvi + 427pp.

• **Course objectives:** We will work toward covering the basics of chapters II - VI of Knapp. Topics include the following:

- (a) Ch. II: Basic projective geometry (non-singularity, inflection points, intersection multiplicity, homogeneous polynomials, Bézout's Theorem).
- (b) Ch. III: Elliptic curves (non-singular projective plane curves of degree 3 with a rational point) in Weierstrass form; the j -invariant and discriminant; the group of rational points on an elliptic curve.
- (c) Ch. IV: Structure of the group of rational points on an elliptic curve (the Mordell - Weil Theorem); heights of rational points.
- (f) Ch. V: Structure of rational points of finite order (torsion points) in the group of rational points on an elliptic curve (reduction of curves modulo p , Nagell-Lutz Theorem).
- (e) Ch. VI: Structure of *complex* points on an elliptic curve; analytic isomorphism between lattices in \mathbb{C} and elliptic curves; elliptic functions (the Weierstrass p -function).

• **Other references:**

- (1) Cassels, J.W.S.; Lectures on Elliptic Curves, London Math. Soc. Student Text 24.
- (2) Husemöller, Dale; Elliptic Curves, Springer GTM 111.
- (3) Koblitz, Neal; Introduction to Elliptic Curves and Modular Forms, Springer GTM 97.
- (4) Milne, J.S.; Elliptic Curves (Kea Books).
- (5) Silverman, Joseph H.; The Arithmetic of Elliptic Curves, Springer GTM 106.
- (6) Silverman, Joseph H. and Tate, John; Rational Points on Elliptic Curves, Springer UTM.

- **Class schedule:**

Lecture : Tu/Th 4:45 - 6:00 LeConte 303B

- **Homework:** There will be several homework assignments. These will be collected and graded.

- **Exam schedule:** (in formats to be determined)

Mid – Term Exam : Thursday, October 23 4:45 - 6:00 LeConte 303B

Final exam : Thursday, December 11 9:00 - 12:00 LeConte 303B

Letter grades will be given based on homework and exams.

- Please do not hesitate to contact me at any time if you have questions or problems relating to this course. Best wishes for an enjoyable and productive semester!