

Iwasawa Theory of Elliptic Curves.

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This is the draft description of the course which will be given in the week from May 19th to 23rd, 2008 at the Facultat de Matemàtiques i Estadística (FME) of the Universitat Politècnica de Catalunya (UPC). This is an activity organized by Victor Rotger (vrotger@ma4.upc.edu) from the Number Theory Group at UPC. You may contact him for further details if you are interested in attending the seminar.

There will be five sessions of a double hour (with a break in between) and an additional computer-oriented session.

The approximative contents, which may well have to be adapted to the audience, is listed here:

First lecture

- Recall basics about the arithmetic of elliptic curves.
- Recall basics about Galois cohomology.
- Selmer groups.
- Iwasawa modules.

Second lecture

- Control theorem for curves with good ordinary reduction.
- Euler characteristic for finite Selmer groups.

Third lecture

- Analytic p -adic heights.
- Geometric and Iwasawa-theoretic p -adic heights.
- Euler characteristic formula.

Fourth lecture

- p -adic L -functions.
- The main conjecture.
- Kato's zeta elements.
- Euler systems.

Fifth lecture

- The supersingular case.
- The multiplicative case.
- Non-commutative Iwasawa theory.

Additional lecture

Use of **sage** for computational Iwasawa theory of elliptic curves.

Some References

- John Coates and Ramdorai Sujatha, *Galois cohomology of elliptic curves*, Tata Institute of Fundamental Research Lectures on Mathematics, vol. 88, Narosa Publishing House, 2000.
- John Coates, Ralph Greenberg, Kenneth A. Ribet and Karl Rubin, *Arithmetic theory of elliptic curves*, Lecture Notes in Mathematics, vol. 1716, Springer, 1999, Lectures from the 3rd C.I.M.E. in Cetraro, 1997.
- Ralph Greenberg, *Introduction to Iwasawa Theory for Elliptic Curves*, <http://www.math.washington.edu/~greenber/research.html>.
- Barry Mazur and John Tate, *The p -adic sigma function*, Duke Math. J. **62** (1991), no. 3, 663–688.
- Bernadette Perrin-Riou, *Théorie d'Iwasawa et hauteurs p -adiques (cas des variétés abéliennes)*, Séminaire de Théorie des Nombres, Paris, 1990–91, Progr. Math., vol. 108, Birkhäuser, 1993, pp. 203–220.

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