

# STUDY GROUP IN IWASAWA THEORY

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We will meet online every Friday from 10 to 12, starting on 03/12/2021. The meetings will take place in the Number Theory Seminar's 'team' on Microsoft Teams. Please contact me if you wish to join.

Below is a preliminary list of topics, each with some associated references.

## 1. IWASAWA ALGEBRAS AND MODULES

Sections V.1, V.2 and V.3 of

(NSW) J. Neukirch, A. Schmidt, K. Wingberg, Cohomology of number fields, Springer, 2000.

## 2. CLASSICAL IWASAWA THEORY OF NUMBER FIELDS

Proof of Iwasawa's Control Theorem and statement of Iwasawa's Main Conjecture. References:

- Section XI of (NSW).
- J. Coates, R. Sujatha, Cyclotomic Fields and Zeta Values, Springer, 2006.
- (Wa) L. C. Washington, Introduction to Cyclotomic Fields, Springer, 1997 (2nd ed.).
- R. Sharifi, Iwasawa theory, lecture notes, available at <https://www.math.ucla.edu/sharifi/iwasawa.pdf>

## 3. $p$ -ADIC ZETA AND $L$ -FUNCTIONS

- N. Koblitz,  $p$ -adic Numbers,  $p$ -adic Analysis and Zeta Functions, 1984 (2nd ed.).
- J. W. S. Cassels, Local Fields, LMS 3, 1986.
- (Wa)

## 4. MAZUR'S CONTROL THEOREM FOR ELLIPTIC CURVES

The main reference will be

- R. Greenberg, Introduction to Iwasawa theory for elliptic curves, IAS/Park City Mathematics Series 9 (2001) 407-464.

A complementary 'descent' result and numerous examples may be found in sections 4 and 5, respectively, of

- R. Greenberg, Iwasawa theory for elliptic curves, Lecture Notes in Math. 1716 (1999) 51-144.

## 5. KUMMER THEORY FOR ELLIPTIC CURVES

Sections 1 to 4 of

- J. Coates, R. Greenberg, Kummer theory for abelian varieties over local fields, *Invent. Math.* 124 (1996) 129-174.

## 6. GREENBERG'S GENERALISATIONS OF MAZUR'S CONTROL THEOREM

- R. Greenberg, Galois Theory for the Selmer Group of an Abelian Variety, *Comp. Math.* 136 (2003) 255-297.

## 7. IWASAWA THEORY FOR FUNCTION FIELDS

- A. Bandini, F. Bars, I. Longhi, Aspects of Iwasawa theory over function fields, in 't-Motives: Hodge structures, transcendence and other motivic aspects', EMS Series of Congress Reports 16 (2020) 375-416.
- B. Anglés, A. Bandini, F. Bars, I. Longhi, Iwasawa Main Conjecture for the Carlitz cyclotomic extension and applications, *Math. Ann.* 376 (2020) 475-523.

And subsequent articles by these authors.

8.  $p$ -ADIC  $L$ -FUNCTIONS FOR ELLIPTIC CURVES

- B. Mazur, P. Swinnerton-Dyer, Arithmetic of Weil curves, *Invent. Math.* 25 (1974) 1-61.
- B. Mazur, J. Tate, J. Teitelbaum, On  $p$ -adic analogues of the conjectures of Birch and Swinnerton-Dyer, *Invent. Math.* 84 (1986) 1-48.