LTCC Advanced Course

Title: Beilinson's conjectures

Basic Details:
- Core Audience (2nd/3rd yr: pure)
- Course Format (**Extended**: 5 x 2hr lectures)

Course Description: Beilinson's conjectures give a breathtakingly beautiful and surprising relationship between the algebraic cycles on algebraic varieties over number fields and their L-functions. They are a vast generalisation of Dirichlet's unit theorem and the Birch and Swinnerton-Dyer conjecture. The conjectures are wide-open in general but are known in some special but already very interesting cases. In this course we will first introduce the machinery required to state the conjectures (motivic cohomology, Deligne cohomology, regulators), and then explore some low-dimensional examples.

- Keywords: Algebraic cycles, special values of L-functions, motives
- Syllabus: Lecture 1: Motivic cohomology, Lecture 2: Deligne cohomology and regulators, Lecture 3: Beilinson's conjectures, Lecture 4: The case of number fields, Lecture 5: K_2 of CM elliptic curves, or $H^3(X, 2)$ of some surfaces X
- Recommended reading: Ramakrishnan - Regulators, algebraic cycles, and values of L-functions
- Additional Optional reading: Nekovar – Beilinson's conjectures, Rapaport-Schappacher-Schneider – Beilinson's conjectures and special values of L-functions, Schneider-Scholl – The Beilinson conjectures
- Prerequisites: Some familiarity with a little algebraic geometry, algebraic number theory and maybe modular forms might be helpful.

Format:
- No of discussion/problem sheets: 4
- Electronic lecture notes (these are strongly encouraged, as they will form the core of the individual study of the students): Yes
- Necessary support facilities: None

Lecturer Details:
- Lecturer: Dr Oli Gregory
- Lecturer home institution: Imperial College London
- Lecturer e-mail: o.gregory22@imperial.ac.uk
- Lecturer telephone number: +44 7826844283