

# Intensive Course: *L*-functions

May 18–19, 2009

- Title: *L*-functions
- Basic Details:
  - Core Audience: 1st-2nd year: pure
  - Course Format: intensive (8 hours)
- Course Description:
  - Keywords: Riemann zeta function, Dirichlet *L*-functions, Modular forms, Eisenstein series, Hyperbolic Geometry
  - Syllabus: The purpose of this course is to introduce L-functions to the audience. They are fundamental objects in mathematics: the Millennium prizes (Clay Institute) include two problems related to them: the Riemann hypothesis and the Birch– Swinnerton-Dyer conjecture. The Riemann zeta function and Dirichlet L-functions will be introduced, together with their analytic properties. The GL(2) automorphic L-functions follow: they arise from modular forms (holomorphic and nonholomorphic). As such they relate to the action of discrete subgroups of SL(2, R) on the upper half-plane H. The interplay of hyperbolic geometry with number theory and spectral theory shows the power and versatility of the subject. The aim of the course is to explain some motivating problems (distribution of prime numbers, primes in progressions, points on elliptic curves, distribution of points on more complicated varieties) and how L-functions are uniquely suited for their understanding.
  - Recommended reading: Iwaniec, Henryk Topics in classical automorphic forms. Graduate Studies in Mathematics, 17. American Mathematical Society, Providence, RI, 1997. xii+259 pp. ISBN: 0-8218-0777-3
  - Additional Optional readings: Bump, Daniel Automorphic forms and representations. Cambridge Studies in Advanced Mathematics, 55. Cambridge University Press, Cambridge, 1997. xiv+574 pp. ISBN: 0-521-55098-X  
Patterson, S. J. An introduction to the theory of the Riemann zeta-function. Cambridge Studies in Advanced Mathematics, 14. Cambridge University Press, Cambridge, 1988. xiv+156 pp. ISBN: 0-521-33535-3
  - Prerequisites: Complex Analysis, Basic Number Theory
- Format:
  - No of discussion/problem sheets: 1
  - Electronic lecture notes: will be available before the course at the website:  
<http://www.homepages.ucl.ac.uk/~ucahipe/>
  - Lecture/computer session/tutorial/discussion split (hours of each): 7/0/1/0
- Lecturer Details:
  - Lecturer: Dr Yiannis Petridis
  - Lecturer home institution: University College London
  - Lecturer e-mail: petridis@math.ucl.ac.uk
  - Lecturer telephone number: 020-7679-7897
  - Second Lecturer: Dr Andrew Booker (University of Bristol)