LTCC Course

Title: Enumerative Combinatorics

Level: Advanced – Pure

Course Format: 10h – 5 consecutive Mondays

Session: 2 – 4 November to 2 December 2013

Syllabus:

1. Review of binomial coefficients and Stirling numbers.

2. Formal power series, operations, convergence questions. Application to binomial coefficients and Stirling numbers. Bivariate generating functions.

3. Criteria for unimodality.

4. q-series, Gaussian coefficients, counting subspaces of finite vector spaces, counting lattice paths, the q-binomial theorem.

5. Inclusion-exclusion, applications to Stirling numbers and to chromatic polynomials of graphs.

6. Orbit-counting, cycle index, cycle index theorem, applications.

7. Species, cycle index, counting unlabelled and labelled structures.

8. Lagrange inversion.

9. Cayley's Theorem, with several different proofs (via Pr\"ufer codes, species, and Lagrange inversion).

10. Asymptotics: Stirling's formula, related results and applications.