LTCC Proposed Course

- Title: Measure-theoretic Probability
- Basic Details:
  - Core Audience: Students with an interest in: Probability, Statistics, Analysis.
  - Course Format: Core
- Course Description:
  - Keywords: Measure theory, sigma-field, random variable, stochastic process, martingale, diffusion, weak convergence, Brownian motion, Poisson process, Gaussian process
  - Syllabus: Measure theory: probability as measure, random variable as measurable function, expectation as integral, filtration as information flow, probability spaces, filtered probability spaces [= stochastic bases]. Conditioning via Radon-Nikodym theorem; conditional expectation. Martingales, and the basic martingale convergence theorems.
    Path properties; Markov and strong Markov processes; diffusions as path-continuous strong Markov processes; generators; properties and examples.
    Brownian motion, Poisson process: existence and basic properties. Lévy processes, Lévy-Khintchine formula, Lévy-Itô decomposition (without proofs).
    Gaussian processes and random fields.
    As time allows: Introduction to Itô calculus.
  - Recommended reading:
    David Williams, *Probability with martingales*, CUP, 1991.
  - Additional Optional reading:
    O. Kallenberg, *Foundations of modern probability*, 2nd ed., Springer, 2002.
    G. R. Grimmett and D. Stirzaker, *Probability and random processes*, 3rd ed., OUP, 2001 [Ch. 12, 13]
    J. M. Steele, *Stochastic calculus and financial applications*, Springer, 2001 [Ch. 1-6].
  - Prerequisites:
- Format:
  - No of discussion/problem sheets: 4
  - Electronic lecture notes: TeX lecture notes will be provided as handouts, used on OHP in lectures, and posted on the course website.
  - Necessary support facilities: None (apart from the above).
  - necessary software requirements for computing facilities: None.
  - Proposed timing: 25 Feb – 24 March 2008
  - Lecture/computer session/tutorial/discussion h split: 10/ 0/ 0/0 /
- Lecturer Details:
  - Lecturer: Professor N. H. Bingham
  - Lecturer home institution: Mathematics Department, Imperial College London and Mathematics Department, London School of Economics, University of London