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:

Additional/Optional reading:

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
- Lecture/Computer session split: 10/0h
Lecturer’s details:
- Lecturer: Professor N. H. Bingham
- Lecturer’s home institution: Mathematics Department, Imperial College and Mathematics Department, LSE.