LTCC Basic Statistics Course

- Title: **Stochastic Processes**

- Basic Details:
  - Core Audience: Statistics
  - Course Format: Core (10h)

- Syllabus: The course aims to introduce the main ideas and methods of simple applied probability, covering the following topics, together with examples of a variety of applications:
  1. A brief review of prerequisites (see below) and further discussion of Markov chains in discrete and continuous time; to include random walks, embedded chains. Examples of use of forward and backward decompositions, reversibility arguments and embedded chains.
  2. Point processes in time; Poison-based processes.

- Recommended reading:

  - D R Cox and Valerie Isham (1980) *Point Processes*, Chapman and Hall.
  - Goeffrey Grimmett and David Stirzaker (2001) *Probability and Random Processes*. 3rd ed. OUP.

- Additional/Optional Reading:

  - Daryl Daley and David Vere-Jones (2003) *An Introduction to the Theory ofPoint Processes Volume 1: Elementary Theory and Methods.* Springer
  - Valerie Isham (2005) 'Stochastic models for epidemics: Current Issues and Developments' in *Celebrating Statistics*, eds A.C. Davison, Y. Dodge and N. Wermuth. OUP, pp.27-54.
  - Jesper Møller and Rasmus P Waagepetersen (2007) 'Modern Statistics for Spatial Point Processes (with discussion). *Scand. J. Statist*. 34: 643-711.
  - Sheldon Ross (1996) *Stochastic Processes*, Wiley.

- Prerequisites

Knowledge of Markov processes with discrete state spaces at a level typical of introductory undergraduate courses in applied probability – to include, in discrete time, transient and equilibrium behaviour, first passage times and classification of states; in continuous time, Poisson and birth-death processes.

Recommended texts:

- Sheldon M. Ross, *Introduction to Probability Models* (Academic Press, 2007, 9th ed.) sections: 4.1-4.4, 5.3, 6.1-6.5
- David Stirzaker, *Stochastic Models and Processes* (OUP, 2005) sections 2.5, 3.1-3.6, 4.1-4.6.

- Format:
  - No. of problem sheets: 4
  - Electronic lecture notes: yes
  - Necessary support facilities: none
  - Necessary software requirements for computing facilities: None
  - Lecture/computer session/tutorial/discussion h split: 8/2. Part of each 2-hour session will be set aside to discuss issues arising from the current lecture or from the problems and/or reading set the previous week.

- Lecturer details:
  - Professor Maria De Iorio, UCL
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