M3S4/M4S4 Applied Probability

Emma McCoy, Huxley 522

Format:

1 lecture every 2 weeks will be a revision/problems class.
6 problem sheets (with full solutions after a 2 week delay).
2 pieces of assessed coursework (weeks 5 and 8).
Enhanced coursework distributed in week 9.

Resources:

web page: `stats.ma.ic.ac.uk/~ejm/M3S4`
– full course notes, problem sheets + solutions, past exam papers + solutions, details of assessed coursework.

Feedback:

Comments on the course are welcome via:
email: `e.mccoy@imperial.ac.uk`
anonymously in my pigeon hole.

Recommended reading:

This course is self-contained and there is no single set book. However, background reading is always beneficial and the following books would be suitable:

Grimmet, G. R. & Stirzaker, D. R: Probability and Random Processes, Oxford.

Cox, D. R. & Miller, H. D: The theory of Stochastic Processes, Chapman & Hall.

Feller, W: An introduction to Probability Theory and its applications, Wiley.

Ross, S. M: Introduction to Probability Models, Academic Press.

Course Outline

Introduction
Examples

Revision
Important discrete and continuous probability distributions.

Random/Stochastic processes
Bernouilli process, Poisson process, simple birth process, branching processes. Point processes: non-homogeneous, compound and doubly stochastic Poisson processes.

Branching Processes
Properties of branching processes. Galton-Watson model.

Random Walks
Absorbing and reflecting barriers. Gambler's ruin.

Markov Chains
Chapman-Kolmogorov equations. Recurrent, transient, periodic, aperiodic chains. Return probabilities. Stationary distribution.

Birth and Death Processes
Differential difference equations and pgfs. Embedded processes. Time to extinction.

Queues
Long term behaviour. Traffic intensity. Waiting times. Steady states.