

## Probability III

### Key Learning Objectives

1. Specify a given discrete time Markov chain in terms of a transition matrix and a transition diagram. Calculate  $n$ -step transition probabilities.
2. Use the method of first step analysis to calculate absorption probabilities and mean time to absorption for an absorbing discrete time Markov chain.
3. Find equilibrium and limiting distributions for finite state discrete time Markov chains, and understand the relation between them for irreducible and regular chains.
4. Determine whether states are recurrent or transient in simple cases.
5. Know and use the definition of the Poisson process, in both infinitesimal form and otherwise.
6. Know and use the definition of, and the relation between, the waiting times and sojourn times for the Poisson process and the general birth process.
7. For a birth-death process, derive and use the backwards and forwards differential equations. Find the equilibrium distribution. (Note: birth processes are a special case of this).