Markov chains are central to the understanding of random processes. This is not only because they pervade applications, but also because one can calculate explicitly many quantities of interest. This textbook, aimed ad advanced undergraduate or MSc students with some background in basic probability theory, focusses on Markov chains and develops quickly a coherent and rigorous theory. In a non-technical way, it explains methods of calculation for transition probabilities, hitting probabilities, long-run averages and equilibrium probabilities.

The author presents both discrete-time and continuous-time chains and also discusses reversibility. He uses random walks as important examples, as well as Poisson prcesses and birth-and-death processes. A distinguishing feature of the book is an introduction to more advanced topics such as martingales and potentials, in the established context of Markov chains. There are applications to simulation, economics, optimal control, genetics, queues and many other topics.

There is a careful selection of exercises and examples drawn both from theory and practice. The book will therefore be an ideal text either for elementary courses on random processes or those that are more oriented towards applications.

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