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## Stochastic Processes and Applications

STAT-455\*

Many systems evolve with an inherent amount of randomness in time and/or space. The focus of this course is on developing and analysing probability models that capture the salient features of this randomness in an effort to predict the short and long term effects of this randomness on the systems under consideration. The study of probability models for stochastic processes involves a broad range of mathematical and computational tools. This course will strike a balance between the mathematics and the applications, with an bias towards the operational (i.e. applied) side of things.

**Textbook:** *Introduction to Probability Models*, 7th Edition  
by S. M. Ross (Academic Press)

**Prerequisite:** STAT-251\* or 356\*.

**Instructor:** G. Takahara

**Evaluation:**

Final examination	40%
Midterm test	20%
Assignments	40%

**Outline:**

- Conditional Probability and Conditional Expectation
- Markov Chains in discrete time
- The Poisson Process
- Markov Processes in continuous time
- Queueing Theory
- Additional topics may include Renewal Theory and Brownian Motion, as time permits