

IEDA 3250: Stochastic Models Fall, 2024

Instructor: Professor Rachel Zhang, Rm 5539, rzhang@ust.hk, 2358-7113
Class Schedule: 10:30 – 11:50 am, Monday and Wednesday, CYTG010
TAs: Wenxin Qiu wqiu@connect.ust.hk (Rm 5569)
Zhihao Li zlix@connect.ust.hk (Rm 5569)
Hao Su
Tutorial hours: Thursday 11:00 – 11:50 am (T1: CYTG009B)
Wednesday 12:00 – 12:50 pm (T2: Rm 1527)

Course Objectives: A Markov process is a particular type of stochastic process where, given the current state, the future is independent of the past (this is the Markov property). If something is “stochastic”, then it involves chance or uncertainty. In the second half of Operations Research/Management Science, *Stochastic Models*, we will learn the mathematical language used to study real-world processes that involve uncertainty and have the Markov property. Because this is an introductory course, we will focus predominantly on tools rather than applications. Applications will be given whenever possible but, just as scales must be learnt when studying piano, there will be situations where no applications are obvious at our level of knowledge.

Topics to be discussed include four parts: probability review, Markov chains, Poisson processes and continuous time Markov chains, and queuing theory. We devote an equal amount of time to each of the four parts.

Prerequisites: Students are expected to have the necessary prerequisites in probability theory and have taken (I) IEDA 2520 (Probability for Engineers) and IEDA 2540 (Statistics for Engineers), or (II) MATH 2411 and MATH 2421.

This course is also a prerequisite for IEDA 4331 (Quantitative Methods in Financial Engineering), IEDA 4420 (Dynamic Pricing and Revenue Optimization), IEDA 4510 (Systems Risk Management) and IEDA 4520 (Numerical Methods for Financial Engineering).

Text: *Introduction to Probability Models*, by Sheldon Ross, Academic Press.

Learning Outcomes: To provide students with a working knowledge of basic Markov processes and their applications (reliability, inventory management, and queueing).

1. To reinforce knowledge of basic probability and mathematics.
2. To further students’ abilities in analytical thinking.

Grading: 4 quizzes (100%) on Sept 23(M), Oct 16(W), Nov 6(W), and Nov 27(W)

The quizzes are closed book, but you are allowed to bring in a cheat sheet (both sides) and a calculator. You are responsible for following the course materials and completing homework assignments, not to be turned in, on time whose solutions will be provided. Lecture notes, Homework and solutions as well as tutorial materials will be available on Canvas under Files.

Tutorial schedule: T2 on Wednesday and T1 on Thursday

- Probabilities: T2: Sept 11, (Sept 18 is a holiday)
T1: Sept 12, Sept 19
- DTMC: T2: Oct 2, Oct 9
T1: Oct 3, Oct 10
- CTMC: T2: Oct 23, Oct 30
T1: Oct 24, Oct 31
- Queueing: T2: Nov 13, Nov 20
T1: Nov 14, Nov 21