

Course Outline

Course Code : DBA3711
Course Title : Stochastic Models in Management
Class Date : From 13/1/2025 to 18/4/2025
Semester : Semester 2, Academic Year 2024/2025
Faculty : Professor Hanqin Zhang
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Overview

Stochastic Models in Management make use of analytical methods (in particular, probabilistic method) to distil intelligence for business leaders' decision-making. Thus, this module is concerned with modelling, analyzing and solving quantitative problems in management, and shall find applications in fields like finance, economics, marketing science, operations management, service management, logistics, and engineering.

Course Objectives

As an introductory module, we strive for breadth, giving an overview of several practical approaches, as well as sufficient depth, so as to provide a substantial feel for the discipline and a good foundation for further studies. The course objective is to deliver

- Practical, Hands-On Experience: Work with real-world data to bridge theory with practice;
- In-Demand, Career-Ready Skills: Learn to model, analyze, and solve complex quantitative problems, giving you a competitive edge in today's data-driven market. This sets you apart from peers who just use out-of-box models;
- Managerial Insights: Discover how to transform quantitative solutions into strategic managerial decisions, enhancing your leadership capabilities;
- Diverse Applications: Whether you're in finance, marketing, operations, or any other field, this course provides versatile skills that are applicable across all business sectors.

Topics include discrete-time Markov chains, continuous-time Markov chains, the Poisson process, the renewal reward theory, queueing models, stochastic inventory model, production planning models, customer brand-switching models, insurance contract models, and optimal staffing problems in service management.

Assessment

Assessment Components	Weightage
Class Participation	10%
Assignment (3)	30%
Project	20%
Test I	20%
Test II	20%

Schedule and Outline

Lesson/ Week	Date	Session
1	Jan. 16	Course Overview
2	Jan. 23	Review: Probability
3	Jan. 30	Probability Estimates Based on Data
4	Feb. 06	Probability Estimates Based on Data: Case Studies from Insurance Companies
5	Feb. 13	Stochastic Inventory Model Based on Data
6	Feb. 20	Discrete-time Markov Chains: Examples and Analysis Method
7	Mar. 06	Midterm Test and Discrete-time Markov Chains from Datasets
8	Mar. 13	Discrete-time Markov Chains Applications in Operations Management
9	Mar. 20	Discrete-time Markov Chains Applications in Marketing
10	Mar. 27	Continue-time Markov Chains: Examples and Analysis Methods
11	Apr. 03	Continue-time Markov Chains Applications: Queues and Production Planning
12	Apr. 10	Continue-time Markov Chains Application: Optimal Staffing in Service Management
13	Apr. 17	Final Test, and Project Presentation & Discussion

Reference Books:

- [1] Feldman, R.M. and C. Valdez-Flores, *Applied Probability and Stochastic Processes*, 2nd edition, Springer, 2010.
- [2] Ross S., *Introduction to Probability Models*, 10th edition, Academic Press, 2010.
- [3] Durrett R., *Essentials of Stochastic Processes*, 2nd edition, Springer, 2012.

Couse Material Delivery Format:

For each topic, we first spend about one hour to discuss its concepts and principles. Then use Excel to analyze some real examples related to this topic, and further enhance our understanding on the concepts and principles.