

NATIONAL UNIVERSITY OF SINGAPORE
NUS BUSINESS SCHOOL
Department of Analytics & Operations

DSC3215 Stochastic Models in Management

Lecturer : Adjunct Associate Professor Xue-Ming YUAN

Session : Semester II, 2017/2018

Prerequisite

There is no formal prerequisite for this module. However, it assumes good prior , coding and programming skills.

Course Objective

Uncertainties are everywhere in the real world. For instance, it is always uncertain for the price of a stock to go up or down in the next few days. Stochastic models are able to represent and capture various uncertainties in business environments, and assist a decision maker to come up with a right decision in practice.

Stochastic Models in Management will equip students with versatile techniques and skills in modelling, analyzing and solving stochastic quantitative problems in management, which are applicable to Operations Management, Supply Chain Management, Marketing, Services, and so on and so forth.

This module has not only its wide breadth, but also its sufficient depth. It aims to provide students a good foundation for their further studies and future careers. The main contents include Applied Probability, Stochastic Processes (e.g., Discrete and Continuous Time Markov Chains, Poisson Process), and a number of application cases and examples which are from industries such as Healthcare, Manufacturing and Services, Logistics and Supply Chain, Retail, etc.

Course Outline

1. Stochastic Models in Management: Overview
2. Basic Applied Probability: Conditional Probability, Random Variables, Mean, Variance, Bayes' Formula
3. Data Based Probabilistic Estimates: Functions of Random Variables, Inequalities, Limit Theorems
4. Stochastic Inventory Models: Single Period Model, Multiple Period Model, Models with and without a Fixed Ordering Cost
5. Discrete Time Markov Chains: Markov Property, Transition Probabilities, Stationary Distribution
6. Stochastic Models in Operations Management: Ruin Probabilities, Markovian Reward Problems, PageRank Application
7. Stochastic Models in Marketing: First Order Markovian Model, Second Order Markovian Model

8. Continuous Time Markov Chains: Markov Property, Generator, Stationary Distribution
9. Queueing Systems: M/M/1, M/M/c, M/G/1, G/M/1
10. Stochastic Models in Services: Priority Service System, Healthcare System
11. Stochastic Networks: Jackson Network, BCMP Network

First Lecture

The students who are considering to sign up for this module should not miss the first lecture. The first lecture will give you a good idea about this module. You can then make an informed decision on whether to take this module in this semester.

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.

Assessment Method (tentative)

Assessment will be based on the following components:

Class Participation	10%
Assignment	20%
Project	20%
Exam	50%

Other Information

Weekly 3 hour sessions (combination of lectures and tutorials).

IVLE

All lecture notes will be posted in IVLE-DSC3215 at least 2 days before the lectures.
All assignments will be posted in IVLE-DSC3215 at least 1 week before the tutorials.