University of Alberta
Alberta School of Business
Department of Accounting, Operations and Information Systems

OM 702 – Stochastic Models – Winter 2019

Instructor: Bora Kolfal, Ph.D.
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Office hours: 2:00 – 4:00 PM on Wednesdays, or by appointment.

COURSE DESCRIPTION:

The course provides a general introduction to stochastic models, with emphasis to applications in operations management (OM), especially queueing theory. The focus will be on theory, followed by reading and discussion of selected relevant papers. This course may be appropriate for some graduate students in engineering or computing science. Students are expected to be familiar with topics from intermediate-level calculus, elementary linear algebra, and elementary probability theory.

Prerequisites: A graduate or an undergraduate course in operations management. Open to all doctoral students or with the written permission of the instructor. Approval of the Business PhD Program Director is also required for non-PhD students.

COURSE INFORMATION:

Lecture Time and Location: Mondays 2:00 – 4:50 PM in classroom Tory B 100.

No class on February 18th (Winter Term Reading Week).

The meeting times and places may vary from week to week, in consultation with students.

If we decide to use the existing course eClass site (https://eclass.srv.ualberta.ca/portal/), supplementary course materials, including the lecture slides and assignments will be posted there. However, if we decide not to use eClass, we will switch to an alternative method, such as email or Google drive.

Lectures will typically involve theory presentation, working out examples, discussions, and paper presentations. Students will need to attend and participate in each class.

REQUIRED AND SUPPLEMENTARY TEXTS:

1. **(Required)** *Introduction to Probability*, Dimitri P. Bertsekas and John N. Tsitsiklis, 1st ed., Athena Scientific, 2002.

Any edition of this textbook will be OK for the course, however, different versions might have different in-chapter and end-of-chapter exercises, or the same exercises in a different order.

You might need further reading material on some of the topics we cover; some supplementary textbooks are listed below. Keep in mind that the topics we cover are very well-studied, and therefore, there are plenty of lecture notes from courses at different universities and chapters from different textbooks are available online. You might need to refer to such materials throughout the term.

2. **(Supplementary)** *Stochastic Models in Queueing Theory*, Jyotiprasad Medhi, 2nd ed., Academic Press, 2002.
3. **(Supplementary)** *Stochastic Processes*, Sheldon Ross, 2nd ed., Wiley, 1995.
4. **(Supplementary)** *An Introduction to Stochastic Processes*, Edward P.C. Kao, Duxbury, 1996.
5. **(Supplementary)** *Queueing Systems, Volumes I and II*, Leonard Kleinrock, Wiley, 1975 and 1976.
6. **(Supplementary)** *Modeling and Analysis of Stochastic Systems*, Vidyadhar G. Kulkarni, 3rd ed., Chapman & Hall, 2016.

EVALUATION:

1. **Assignments:** 40% total weight for assignments related to the topics covered.
2. **Papers:** 20% total weight for paper presentation, discussion, and possibly some related assignments.
3. **Final exam:** 40% weight for the final exam in April. Final exam will cover all of the materials. Final exam time and location: TBA.

OFFICE HOURS:

Office hours are on Wednesdays between 2:00 – 4:00 PM, or by appointment. To make an appointment, please send me an email with a very brief description of the topic and list at least three alternative times that works for you.

TOPICS:

1. **Preliminary materials**

   This module will focus on basic mathematical background needed for the rest of the course. Topics will include basic probability theory, conditioning, and transforms.

2. **Poisson and renewal processes**
3. **Discrete-time Markov chains**
4. **Continuous-time Markov chains**
5. **Queueing systems**

   In this module, we plan to cover various queueing systems, such as: exponential models for birth-and-death systems, Markovian models for non-birth-and-death systems, and systems with general arrival and service-time distributions. Topics covered in this module will depend on our pace throughout the term.

6. **Further topics**

   Depending on the time we have left towards the end of the term, if any, we will cover further topics in this module. The list of potential topics includes Brownian motion and heavy-traffic approximations.

NOTES:

Policy about course outlines can be found in Section 23.4(2) of the University Calendar.

Students who require accommodations in this course due to a disability affecting mobility, vision, hearing, learning, or mental or physical health are advised to discuss their needs with Specialized Support and Disability Services (SSDS), 2-800 Students' Union Building, 492-3381 (phone) or 492-7269 (TTY).

The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Code of Student Behaviour (online at www.governance.ualberta.ca) and avoid any behaviour which could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

Audio or video recording of lectures, labs, seminars or any other teaching environment by students is allowed only with the prior written consent of the instructor or as a part of an approved accommodation plan. Recorded material is to be used solely for personal study, and is not to be used or distributed for any other purpose without prior written consent from the instructor.

All assignments (except for the group activities, if any) are to be completed individually.