DALHOUSIE UNIVERSITY

Faculty of Science Course Syllabus
Department of Mathematics and Statistics
MATH/STAT 4370/5370
Stochastic Processes
Fall 2020

Instructor(s): Dr. Edward Susko, Edward.Susko@dal.ca

Lectures: Lectures will be pre-recorded and posted on BrightSpace in advance of the lecture times TR 11:35-1:00.

Office Hours: You can contact me via email. I will be available for virtual meetings starting at 11:30 on Thursdays via Microsoft Teams. Such meetings will only take place if at least one person requests a virtual meeting.

There are no planned synchronous components.

Course Description

The theory and application of stochastic processes. Topics to be discussed include the Poisson process, renewal theory, discrete and continuous time Markov processes, and Brownian motion. Applications will be taken from the biological and physical sciences, and queueing theory.

Course Prerequisites

STAT3360 or instructor's consent

Learning Objectives

Stochastic processes are collections of random variables, usually indexed by time or space. Students will learn how conditioning can be used to derive properties of stochastic processes. Students will learn about the properties of branching processes, a major model of population growth. Students will learn about counting processes with emphasis on the properties of Poisson processes. Students will be able to derive properties and major results. Students will learn about discrete and continuous Markov chains. They will understand the connections between discrete and continuous Markov processes and heir various characterizations. Students will be able to determine equilibrium distributions, expected waiting times and how to convert rate matrices into transition probabilities. Students will understand the general ideas of renewal processes and how results can be derived from renewal properties. Students will become familiar with major applications of Markov chain modeling to queueing theory, phylogenetics and birth-death processes.

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Course Materials

Introduction to Probability Models, Sheldon Ross. 11th Edition.

Course Assessment

Component	Weight (% of final grade)	Date
Assignments	50%	9-10 weekly assignments
Tests	50%	5 tests. Each 1.5 hours long
Test 1	10%	Tues, Oct 06
Test 2	10%	Tues, Oct 27
Test 3	10%	Tues, Nov 24
Test 4	10%	Tues, Dec 01
Test 5	10%	Thurs, Dec 17

Assignments will be handed out weekly on Tuesdays (starting in Week 2 – Sep 15) and due at 9:30 am on Friday the next week.

Tests will be available for 24 hours starting at 9:30am on the day of the test.

Handwritten submissions of tests/assignments are fine but should be converted to a single pdf document and then uploaded. Additional time is being allowed for this purpose.

Tests can be submitted up to 1 hour after the test ends but will receive a late penalty of 30%. Tests submitted directly to me will also receive a late penalty of 30%.

Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale

A+ (90-100)	B+ (77-79)	C+ (65-69)	D (50-54)
A (85-89)	B (73-76)	C (60-64)	F (<50)
A- (80-84)	B- (70-72)	C- (55-59)	

Course Policies

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This course follows the university policy on “missed or late academic requirements due to student absence” for assessments:

https://www.dal.ca/dept/university_secretariat/policies/academic/missed-or-late-academic-requirements-due-to-student-absence.html

Students experiencing a short-term absence which results in an assessment being missed must do the following:

- Contact the instructor(s) by e-mail prior to the scheduled due date of the assessment,
- Complete a Student Declaration of Absence Form within 3 calendar days of the last day of absence.

Late assignments will not be accepted.

It is expected that each student will write up their assignments independently.

Students can use course material, including lecture notes, text and assignments in completing tests. The use of internet content and assistance from others is not allowed.

Course Content

Basic Probability and Conditioning
Branching Processes
Poisson Processes
Discrete Time Markov Chains
Continuous Time Markov Chains
Additional Topics