COURSE INFORMATION

Course title:	Analyzing and Modeling Uncertainty		
Course code:	BABS 506	Credits:	1.5
Session, term, period:	2019W1, Period 1	Class location:	ANGU 132
Section(s):	BA1	Class times:	Tue/Thu 4-6pm
Course duration:	Sep 3 to Oct 12, 2019	Pre-requisites:	n/a
Division:	Operations & Logistics	Co-requisites:	n/a
Program:	MBAN		

INSTRUCTOR INFORMATION

Instructor:	Hao Zhang, PhD		
Phone:	604-827-3728	Office location:	ANGU 472
Email:	hzhang01@mail.ubc.ca	Office hours:	Mon 1-2pm; Fri 10am-12pm

COURSE DESCRIPTION

Randomness or uncertainty is an essential phenomenon in the modern business world. Probability theory provides the foundation for understanding and analyzing real-world situations and problems involving uncertainty. This course is designed to acquaint students with basic probability concepts, methods, and models. Particular emphasis is given to widely applicable probability models such as distributions of random variables and discrete-time Markov chains. Applications are drawn from various areas in business, economics, science, and technology.

COURSE FORMAT

Class time will be used for a combination of lectures, discussion, and solving sample problems. Attendance is expected to accomplish the learning objectives below. Lectures and discussions will assume that students have pre-read the corresponding chapters as listed in the course schedule below.

LEARNING OBJECTIVES

By the end of this course, students will be able to:

1. Explain fundamental concepts, models, and methods of probability theory
2. Develop intuitions for models incorporating uncertainty
3. Build models for real-world situations involving uncertainty
4. Analyze probability models using popular tools such as the analytics programming language R

ASSESSMENTS

Summary

Component	Weight
In-class Exercise	10%
Homework Assignments	30%
Final exam	50%
Class participation	10%
Total	100%

Details of Assessments

Homework Assignments:

There will be weekly assignments throughout the course. You will be randomly paired with another student for each assignment, and you should work primarily with your designated partner on the assignment. Each team only needs to submit one answer report. Copying other students' answers is prohibited. Assignments should be submitted at the beginning of the class on the due date. All assignments should be submitted as hard copies.

Final Exam:

Students are responsible for making sure they appear for the exam on time. No latecomers will be admitted. Students who fail to write the exam, without prior instructor's permission, will not be given any "make-up'" exam. The exam will be open book and open notes.

In-class Exercises:

There will be a random number of exercises in each class. Some of them will be answered individually and be graded. Answers will be submitted through Canvas Assignments/Quizzes. For this purpose, you are expected to bring a laptop or smartphone to each class. However, the school's Lids Down policy will be observed and you should open the laptop or smartphone only when asked to do so.

Class Participation:

We all bring experience and knowledge into the classroom, and all class participants should share this and benefit by it. Effective class participation includes

- Being prepared for class participation
- asking questions about concepts from lectures or readings
- sharing your experience or point of view with the class
- building on points raised by others;
- clarifying issues or
- relating topics discussed to previous class discussions.

Direct student-student interaction is encouraged. Such interaction should be both positive and courteous even when your opinions differ. Class attendance is important. Regular and punctual attendance is a necessary but not a sufficient criterion for high class participation grades.

Positive contributions to class discussion increase your score. Attending class and not speaking has neither a positive nor a negative impact on your participation grade. Further, you can demonstrate your class commitment by following course instructions, emailing me any course relevant examples from the media and/or your own industry experience, which you feel may enhance the class discussion. Failing to attend significant portions of a class session and detrimental participation (including being disrespectful to any class member) decrease your participation score.

LEARNING MATERIALS

Recommended but not required

Ross, S.M. (2009) *Introduction to Probability Models* (10th edition). Academic Press. (Chapters 1-4; other editions are acceptable.)

- This textbook is available for free at the following website: http://bayanbox.ir/view/7776870545953264619/introduction-to-probability-model-S.Ross-math-cs.blog.ir.pdf

COURSE-SPECIFIC POLICIES AND RESOURCES

Missed or late assignments, and regrading of assessments

Late submissions will not be accepted and will receive a grade of zero.

Academic Concessions

If extenuating circumstances arise, please contact the RHL Graduate School program office as early as reasonably possible, and submit an Academic Concession Request & Declaration Form https://webforms.sauder.ubc.ca/academic-concession-rhlee. If an academic concession is granted during the course, the student will be provided options by RHL, or by the instructor in consultation with RHL, per UBC's policy on Academic Concession.

POLICIES APPLICABLE TO COURSES IN THE ROBERT H. LEE GRADUATE SCHOOL

Attendance

Excepting extenuating circumstances, students are expected to attend 100% of their scheduled class hours. Absent students limit their own academic potential, and that of their classmates, and cause unnecessary disruption to the learning environment. Students missing more than 20% of the total scheduled class hours for a course (including classes held during the add/drop period) without having received an academic concession will be withdrawn from that course. Withdrawals, depending on timing, could result in a "W" or an "F" standing on the transcript.

Punctuality

Students are expected to arrive for classes and activities on time and fully prepared to engage. Late arrivals may be refused entry at the discretion of the instructor or activity lead. Students arriving later than halfway through a scheduled class will be treated as absent for that class.

Electronic Devices

Devices such as laptops, tablets, and cell phones are not permitted to be used in class unless directed by the instructor for in-class activities. Students who do not follow the School's policy in this regard may be required to leave the room for the remainder of the class, so that they do not distract others. Research shows that students' use of laptops in class has negative implications for the learning environment, including reducing their own grades and the grades of those sitting around them.

Citation Style

Please use the American Psychological Association (APA) reference style to cite your sources.

Details of the above policies and other RHL Policies are available at:
http://www.calendar.ubc.ca/vancouver/index.cfm?tree=12,199,506,1625

UNIVERSITY POLICIES AND RESOURCES

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors

of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available on the UBC Senate website at https://senate.ubc.ca/policies-resources-support-student-success.

Academic Integrity

The academic enterprise is founded on honesty, civility, and integrity. As members of this enterprise, all students are expected to know, understand, and follow the codes of conduct regarding academic integrity. At the most basic level, this means submitting only original work done by you and acknowledging all sources of information or ideas and attributing them to others as required. This also means you should not cheat, copy, or mislead others about what is your work. Violations of academic integrity (i.e., misconduct) lead to the breakdown of the academic enterprise, and therefore serious consequences arise and harsh sanctions are imposed. For example, incidences of plagiarism or cheating may result in a mark of zero on the assignment or exam and more serious consequences may apply if the matter is referred to the President's Advisory Committee on Student Discipline. Careful records are kept in order to monitor and prevent recurrences.

COPYRIGHT

ACKNOWLEDGEMENT

UBC's Point Grey Campus is located on the traditional, ancestral, and unceded territory of the xwməθkwəy̓əm (Musqueam) people, who for millennia have passed on their culture, history, and traditions from one generation to the next on this site.

COURSE SCHEDULE

(Subject to change with class consultation)

Class	Date	Topic	Readings or Activities	Assessments due
1	Sep 3	**Introduction to Probability Theory (Ch1)** Sample space, events, probabilities, conditional probabilities, independent events	Ch1	
2	Sep 5	Bayes' rule **Random Variables (Ch2)** Discrete RVs, PMF, CDF, expectation, variance	Ch1, Ch2	
3	Sep 10	Examples of Discrete RV: Bernoulli, binomial, geometric & Poisson; Continuous RVs, PDF, CDF, expectation, variance	Ch2	HW1
4	Sep 12	Examples of Continuous RV: uniform, exponential, gamma & normal; Jointly distributed RVs, joint/marginal PMF/PDF/CDF	Ch2	
5	Sep 17	Functions of joint RVs, independent RVs, covariance; Sample mean & variance; Tail bounds (Markov & Chebyshev's Inequalities)	Ch2	HW2
6	Sep 19	Limit theorems (Strong Law of Large Numbers, Central Limit Theorem); **Conditional Probability & Expectation (Ch3)** Discrete and continuous cases	Ch2, Ch3	
7	Sep 24	Computing expectations and probabilities by conditioning (Law of Iterated Expectations, Law of Total Probability); Compound RVs, applications	Ch3	HW3
8	Sep 26	**Discrete-Time Markov Chains (Ch4)** Introduction to stochastic processes, Markov property, transition matrix & diagram, modeling Markov chains, Chapman-Kolmogorov equations	Ch4	
9	Oct 1	Classification of states (recurrent vs. transient, periodic vs. aperiodic), limiting & stationary distributions	Ch4	HW4
10	Oct 3	Applications **Course Review**	Ch4	HW5 (by Oct 5)