COURSE INFORMATION

Course title:	Decision Analysis Under Uncertainty		
Course code:	BAMS 517	Credits:	1.5
Session, term, period:	2023W1, Period 2	Class location:	ANGU 435, DL 125
Section(s):	BA1	Class times:	Tue/Thu 10am-12pm
	BA2		Tue/Thu 8am-10am
Course duration:	Oct 30 to Dec 8, 2023	Pre-requisites:	BABS 506
Division:	Operations & Logistics	Co-requisites:	n/a
Program:	MBAN		

INSTRUCTOR INFORMATION

Instructor:	Hao Zhang, PhD		
Phone:	604-827-3728	Office location:	ANGU 481
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Teaching assistants:	Cong Yang
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COURSE DESCRIPTION

This course provides an introduction to decision making under uncertainty. Topics include Expected Monetary Value, decision trees, the value of information, sequential decision making under uncertainty (i.e., stochastic dynamic programming), expected utility theory (EUT), common violations of EUT, and alternatives to EUT (e.g., Prospect Theory).

COURSE FORMAT

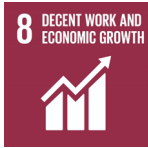Class time will be used for lectures, discussions, and solving exercise problems on paper and laptop computers.

LEARNING OBJECTIVES

By the end of this course, students will be able to:
- Explain how and why individuals might make different decisions under uncertainty
- Understand how to use decision trees to compare options
- Understand when, and how much, to pay for better information
- Identify when individuals are risk-averse vs. risk-neutral vs. risk-seeking
- Describe important behavioral considerations that often arise
- Know how to discount future outcomes and make good sequential decisions under uncertainty

SUSTAINABLE DEVELOPMENT GOALS (SDGS)

At UBC Sauder, we are committed to responsible business practices that can have transformative impacts on society. One of the ways we are reinforcing our commitment to responsible business is by showcasing relevant content in our courses via the lens of the United Nations Sustainable Development Goals. In this course, we will touch on topics that relate to the following goals:

Sustainable Development Goal	Description of how and when the goal is covered in the course.
GOAL 3: Good Health and Well-being	To ensure healthy lives and promote well-being for all, good decisions must be made at various levels, from individuals to healthcare providers to government agencies. The methods and tools learned in this course, such as decision trees and Markov decision processes, have many important applications in this area.
Goal 8: Decent Work and Economic Growth	To build and maintain a sustainable and inclusive economy and productive and decent work environments, good decision-making is essential. This course covers the fundamentals of the theory of decision-making, which equips us with powerful tools to achieve great social objectives.
Goal 12: Responsible Consumption and Production	Good decision-making is also central to attaining sustainable consumption and production patterns. The decision-making models, methods, and tools learned in this course have wide applications in designing and managing local and global supply chains.

ASSESSMENTS

Summary

Component	Weight
Individual Assignment	10%
(Group) Homework Assignments	35%
Final exam	45%
Class participation	10%
Total	100%

Details of Assessments

Homework Assignments:

There will be three group assignments throughout the course. You will be randomly assigned to a three-member team for each assignment. Each team only needs to submit one answer report. Copying other students' answers is prohibited. Reports should be submitted on *Canvas* before 8am on the due date.

Assignment deliverables will include Word documents and possibly Excel workbooks, Python, or R scripts if necessary. If a problem does require Excel/Python/R, clearly label and document your spreadsheets or code, so that someone else can easily follow what you did and replicate your results.

The Word document will present and discuss your decision analysis modeling assumptions, setups, and solutions. When presenting a decision analysis, make sure all parameters (e.g., decisions, probabilities, outcomes) are clearly defined or labeled.

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. More information will be provided after the course begins.

Individual Assignment:

There will be one individual assignment, consisting of a set of questions. The assignment will be announced in Week 3 and due by the end of Week 5. It should be completed by yourself independently and submitted on *Canvas*.

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.

The in-class interactions 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. 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
- Making Hard Decisions: An Introduction to Decision Analysis, 3rd edition by R.T. Clemen and T. Reilly.
  - Relevant sections are indicated in the Course Schedule below (marked with "CR" in the readings column).
- Puterman ML. Markov Decision Processes: Discrete Stochastic Dynamic Programming. John Wiley & Sons; 2014. (marked as "P" in the readings)
- Kahneman D, Tversky A. Prospect Theory: An Analysis of Decision under Risk. *Econometrica*. 1979 May;47(2):263-92. https://www.jstor.org/stable/1914185 (marked as "KT" in the readings)

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.

Code Plagiarism

Code plagiarism falls under the UBC policy for Academic Misconduct. Students must correctly cite any code that has been authored by someone else or by the student themselves for other assignments. Cases of "reuse" may include, but are not limited to:

- the reproduction (copying and pasting) of code with none or minimal reformatting (e.g., changing the name of the variables)
- the translation of an algorithm or a script from a language to another
- the generation of code by automatic code-generations software

An "adequate acknowledgement" requires a detailed identification of the (parts of the) code reused and a full citation of the original source code that has been reused.

Students are responsible for ensuring that any work submitted does not constitute plagiarism. Students who are in any doubt as to what constitutes plagiarism should consult their instructor before handing in any assignments.

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.

Respect for Equity, Diversity, and Inclusion

The UBC Sauder School of Business strives to promote an intellectual community that is enhanced by diversity along various dimensions including Indigeneity (including identification as First Nation, Métis, or Inuit), race, ethnicity, gender identity, sexual orientation, religion, political beliefs, social class, and/or disability. It is critical that students from diverse backgrounds and perspectives be valued in and well-served by their courses. Furthermore, the diversity that students bring to the classroom should be viewed as a resource, benefit, and source of strength for your learning experience. It is expected that all students and members of our community conduct themselves with empathy and respect for others.

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.

Use of Artificial Intelligence

Generative AI Permitted Where Specified With Attribution
For this course, students may use generative artificial intelligence (AI), including ChatGPT, for specific assessments or coursework, where it is expressly specified by the instructor. In these cases of permitted use, students must disclose any use of AI-generated material as per the assessment guidelines.

COPYRIGHT

All materials of this course (course handouts, lecture slides, assessments, course readings, etc.) are the intellectual property of the instructor or licensed to be used in this course by the copyright owner. Redistribution of these materials by any means without permission of the copyright holder(s) constitutes a breach of copyright and may lead to academic discipline and could be subject to legal action. Any lecture recordings are for the sole use of the instructor and students enrolled in the class. In no case may the lecture recording or part of the recording be used by students for any other purpose, either personal or commercial. Further, audio or video recording of classes are not permitted without the prior consent of the instructor.

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	Oct 31	Introduction Data Analysis by Excel Decision Trees	CR: Ch 1-2 Excel Practice	
2	Nov 2	Decision Trees	CR: Ch 3 (pp 73-83), Ch 4 (pp 118-147)	
3	Nov 7	Decision Trees Sensitivity Analysis	CR: Ch 5 (pp 177-212)	HW1
4	Nov 9	Value of Information	CR: Ch 12	
5	Nov 14	Markov Decision Processes (Sequential Decision Making)	P: Ch 1-4	
6	Nov 16	Markov Decision Processes	P: Ch 1-4	HW2
7	Nov 21	Markov Decision Processes	P: Ch 1-4	
8	Nov 23	Risk Attitudes and Utility Theory	CR: Ch 14, Ch 15 (pp 683-691)	
9	Nov 28	Violations of Expected Utility Theory Alternative Decision Analysis Frameworks	CR: Ch 15 (pp 691-703); KT	HW3
10	Nov 30	Subjective Probability Assessment Course Review	CR: Ch 8	Individual Assignment
	Dec 4-8	Final Exam (To be scheduled)		