

### COURSE INFORMATION

Course title:	Decision Analysis under Uncertainty	Credits:	1.5
Course code:	BAMS 517	Class location:	HA 254
Session, term, period:	2021W1, Period 2	Class times:	Tues/Thurs 10 AM - 12 PM
Section(s):	BA1	Pre-requisites:	BABS 506
Course duration:	Oct 26 - Nov 25, 2021	Co-requisites:	n/a
Division:	Operations and Logistics		
Program:	MBAN		
Course website:	<a href="https://canvas.ubc.ca">https://canvas.ubc.ca</a>		

### INSTRUCTOR INFORMATION

Instructor:	Steven Shechter	Office location:	HA 477
Phone:	604-822-8340	Office hours:	By appointment
Email:	steven.shechter@sauder.ubc.ca		

Teaching assistant:	TBD
Office hours:	TBD
Email:	TBD

### COURSE DESCRIPTION

This course introduces 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

The course will consist of live lectures, discussions, and in-class exercises completed using students' own laptops.

### LEARNING OBJECTIVES

- To learn the basic concepts of decision making under uncertainty
- To learn how to analyze decision trees and understand the value of information
- To learn the concepts of stochastic dynamic programming
- To learn the concepts of utility and risk preferences
- To learn about behavioral aspects of decision making under uncertainty

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

- Understand 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

## ASSESSMENTS

### Summary

<u>Component</u>	<u>Weight</u>
Three assignments (equally weighted)	50%
Final Exam	40%
Class Participation/Professionalism	<u>10%</u>
Total	<u>100%</u>

### Details of Assessments

#### Assignments:

There will be 3 homework sets assigned during this course. Homework will be performed by groups of 3-5 students each. You are welcome to form your own groups. If you need help finding a group, please let me know.

Assignment will include a submitted Word document and possibly either Excel or Jupyter notebooks to show your work. Some parts of assignments may also be auto-graded via Canvas questions.

Students not in the same group may discuss assignments at a high level, but are not to share code, solution details, or assignment writeups with each other. The default policy is to assign the same grade to everyone within a group.

#### Final Exam:

There will be a 2.5-hour exam in the examination week. This will be a written exam. More information will be provided after the course begins.

#### Participation/Professionalism:

There are a number of ways to actively participate in the course. These include: asking and answering questions during lecture, sharing thoughts/ideas/news stories/etc. that promote peer-to-peer learning in class and/or via the Piazza discussion forum, participating in office hours, contributing to practice problems (e.g., by solving them and/or proposing new ones), and others.

The professionalism component includes being on time to class, avoiding distractions (e.g., cell phone usage), and treating others with respect. More aspects of professionalism are covered below in the “Robert H. Lee Graduate School” and “University” policies sections.

## LEARNING MATERIALS

### Requirements:

- The lectures will be self-contained and no textbook is required for this course. Copies of the slides used in class will be available on the course website. You should supplement them with your own notes taken during the lectures.

### Suggested Reading Materials:

- Making Hard Decisions: An Introduction to Decision Analysis, 3<sup>rd</sup> 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)

### Technology Requirements:

- Macs or PCs should be equally fine for this course.

## COURSE-SPECIFIC POLICIES AND RESOURCES

### *Missed or late quizzes*

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) <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.

### *COVID-19 Policies for Attendance & Academic Concessions:*

If a student feels unwell, they should stay home and send a courtesy email to each impacted instructor and cc their program manager. The student should also submit an [Academic Concession Request & Declaration Form](#).

If a student suspects possible Covid-19 infection, they should use the BC Ministry of Health’s [self-assessment tool](#), to help determine whether further assessment or testing for COVID-19 is recommended.

If a student is required to self-isolate (e.g., while waiting for test results), they should follow the steps above (stay home, email instructor(s) and program manager, submit an [Academic Concession Request & Declaration Form](#), and follow BC Health Guidance.

Students who are required to quarantine, should get in touch with their Program Manager to discuss the possibility of academic concessions for each impacted course. The Program Manager will work closely with your instructors to explore options for you to make up the missed learning.

### *Covid-19 Safety in the Classroom:*

**Masks:** Masks are **required** for all indoor classes, as per the BC Public Health Officer orders. For our in-person meetings in this class, it is important that all of us feel as comfortable as possible engaging in class activities while sharing an indoor space. For the purposes of this order, the term “masks” refers to medical and non-medical masks that cover our noses and mouths. Masks are a primary tool to make it harder for Covid-19 to find a new host. You will need to wear a medical or non-medical mask for the duration of our class meetings, for your own protection, and the safety and comfort of everyone else in the class. You may be asked to remove your mask briefly for an ID check for an exam, but otherwise, your mask should cover your nose and mouth. Please do not eat in class. If you need to drink water/coffee/tea/etc, please keep your mask on between sips. Students who need special accommodation are asked to discuss this with the program office.

**Seating in class:** To reduce the risk of Covid transmission, please sit in a consistent area of the classroom each day. This will minimize your contacts and will still allow for the pedagogical methods planned for this class to help your learning.

Visit the following website for the most recent updates regarding Covid-19 protocol on campus: <https://students.ubc.ca/campus-life/returning-to-campus>

### *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 status as a First Nation, Metis, Inuit, or Indigenous person, 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.

### *Academic Freedom and Students Studying from Outside Canada*

During this pandemic, the shift to online learning has greatly altered teaching and studying at UBC, including changes to health and safety considerations. Keep in mind that some UBC courses might cover topics that are censored or considered illegal by non-Canadian governments. This may include, but is not limited to, human rights, representative government, defamation, obscenity, gender or sexuality, and historical or current geopolitical controversies. If you are a student living abroad, you will be subject to the laws of your local jurisdiction, and your local authorities might limit your access to course material or take punitive action against you. UBC is strongly committed to academic freedom, but has no control over foreign authorities (please visit <http://www.calendar.ubc.ca/vancouver/index.cfm?tree=3,33,86,0> for an articulation of the values of the University conveyed in the Senate Statement on Academic Freedom). Thus, we recognize that students will have legitimate reason to exercise caution in studying certain subjects. If you have concerns regarding your personal situation, consider postponing taking a course with manifest risks, until you are back on campus or reach out to your academic advisor to find substitute courses. For further information and support, please visit: <http://academic.ubc.ca/support-resources/freedom-expression>

### **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 xwməθkwəyəm (Musqueam) people, who for millennia have passed on their culture, history, and traditions from one generation to the next on this site.

#### ONLINE TEACHING TOOL & REQUIREMENTS

The default for office hours will be to hold them via Zoom. If you don't have a Zoom account yet, please set one up. Links to office hours will be provided once the class begins.

COURSE SCHEDULE

Class #	CLASS TOPICS	ACTIVITIES / READINGS	ASSIGNMENTS / DELIVERABLES
Week 1	Introduction Decision trees	CR: Ch 1-2, 3 (pp 73-87); 4 (pp 118-147)	HW 1 assigned on Oct 29 (Due: Nov 7, by midnight)
Week 2	Sensitivity analysis Value of information	CR: 5 (pp 177-212), 12	
Week 3	Sequential decision making: dynamic programming	P: Ch 1-4	HW 2 assigned on Nov 8 (Due: Nov 17, by midnight)
Week 4	Utility theory and risk preferences	CR: 14, 15	HW 3 assigned on Nov 18 (Due: Nov 27, by midnight)
Week 5	Violations of expected utility theory and alternative Decision Analysis frameworks  Subjective probability assessment	KT	
Week 6	Exam week		