ISOM 3900 DECISION ANALYTICS
Spring 2026
Department of Information Systems, Business Statistics &
Operations Management

Course Description

This course helps students develop better analytical skills in approaching strategic and tactical business decisions. Students will learn to derive solutions or conclusions that require critical thinking, quantitative analysis, and statistical reasoning skills. These skills are essential and indispensable for major business decisions.

Learning Goals

This course is designed in such a way that, after completing it, you will be able to
1. Develop more confidence and appreciation of quantitative reasoning skills to approach business problems, evaluate solutions, and make decisions.
2. Apply advanced quantitative and optimization tools to gain insights from decisions that will help improve business performance.
3. Make informed decisions involving risks and uncertainty using statistical reasoning techniques.

This course will also provide you with opportunities to develop your abilities to
4. Work effectively in a team and lead a team.
5. Communicate in oral and written English in assigned talk contexts.

Class Schedule

ISOM3900 L1:   Mon. and Wed. 10:30 – 11:50 in LSK 1011
ISOM3900 L2:   Mon. and Wed. 09:00 – 10:20 in LSK 1011

Teaching Staff

Instructor: Man Yu (manyu@ust.hk)
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Course Materials

1) Reference textbook: This course covers a wide range of topics, and it is impossible to find a textbook that contains all the topics. For each topic, a few reference books are listed below (the abbreviations will be used later in course outline). It is not required to buy these books. At least one copy of each book is on course reserve in the library. Some books can also be accessed online through the library website.

- Decision Analysis

(ASW) *An Introduction to Management Science: Quantitative Approaches to Decision Making,* by D. Anderson, D. Sweeney, and T. Williams, Thomson/South-Western, 11th Edition.

(BF) *Data, Models, and Decisions: Fundamentals of Management Science,* by D. Bertsimas and R. Freund, South-Western College Pub, 2000 (Library Online Access).

(HA) *Foundations of Decision Analysis,* by R. Howard and A. Abbas, Pearson, 2016.

- Game theory

(DSR) *Games of Strategy*, by A. Dixit, S. Skeath, and D. Reiley, W.W. Norton & Company, International Student Edition, 4th Edition.

(DN) *The Art of Strategy*, by A. Dixit and B. Nalebuff, W.W. Norton & Company.

- Statistical Decision Making

(BLK) *Basic Business Statistics Concepts and Applications*, by M. Berenson, D. Levine, T. Krehbiel, Prentice Hall, 2012.

2) Notes, exercises, and other materials from course Canvas website (http://canvas.ust.hk).

Performance Evaluation

Mini Case Studies	10%
Normal Case Studies	20%
Term Project	25%
Comprehensive Final Exam	45%

Case Studies

Four mini cases and three normal cases will be studied in this course. You will work in a group of up to six students. Each group will analyze two mini cases and two normal cases. Specifically, the cases (mini cases are marked with M) will cover the following four subjects:

(i)   Decision Tree (5%). "Buying a House" (M) and "Eric Agency" (M)

(ii) Value of Information (5%). "Property Purchase Strategy" (M) and "Brainy Business" (M)

(iii) Game Theory (10%). "Pricing Games: Sony PlayStation and Microsoft Xbox" and "Airbus and Boeing: Superjumbo Decisions"

(iv) Statistical Analysis (10%). "MotoTech Manufacturing Company"

Each group will choose one case in each subject (i) - (iv). If a group chooses to analyze both cases in a subject, then the higher score will be counted for the subject.

Case report: Every group will submit a case report for each case that it chooses. Case report is **no more than three pages** (12-point, single spaced, standard margin, Times New Roman, excluding figures and tables). A soft copy of the (typed-up) case reports is due on Canvas at 9am of the day when each case is discussed. Scoring rubric is as below.

Case presentation: For each case, one group will be selected to present the case and lead the class discussion. The case presentation is on volunteer basis, and if multiple groups volunteer, a random draw will be made. Each presenting group will get **up to 1.5 *bonus* points**. The

decision on the presenting group will be made **one week** before the class when each case is discussed. If your group wishes to be selected, be sure to let the TA know <u>as early as possible</u>.

Case questions: There are questions at the end of each mini case for you to answer. For the three normal cases, "Pricing Games: Sony PlayStation and Microsoft Xbox", "Airbus and Boeing: Superjumbo Decisions", and "MotoTech Manufacturing Company", questions to be answered will be separately provided by the instructor.

Term Project

The term project is an important learning component of the course. You will work in the same group as the case group. The purpose of the project is to either apply course concepts and tools to real-life decision problems, or to explore decision-analytical tools beyond those covered in the lectures. Project topics can include (but not limited to):

1. Detailed analysis of a major decision problem. (i) Find a complex decision in business (e.g., product launch, new product development, product line design) or personal life (e.g., job hunting, choosing schools, career choice). (ii) Why is the decision important and why is it difficult? (iii) What are the decision criteria, and why? (iv) How do you analyze the problem? Which tools can be used and how? (v) What is your conclusion/recommendation?

2. Research on a detailed example of how decision analytics learned in the course has been or can be applied in practice. The application can be related to business, engineering, politics, sports, medical, legal, or personal situations.

3. Study of decision-analytics topics that are not covered in the course. For example, group decision making, multi-objective decision making, auctions, bargaining, and games with asymmetric information. Focus should be placed on how these analytical tools have been or can be applied in practice.

The evaluation of the term project will put emphasis on the clarity and depth of analysis, as well as demonstration of a good understanding of basic concepts and tools from the course and their application to the decision problems studied.

The project report will be **ten to twenty-five** pages in the same format as the case report. A one-page project proposal is due on **<u>Mar 23</u>** on Canvas. Each group will present the project in class at the end of the term. A soft copy of the (typed-up) report and the presentation slides should be submitted on Canvas on the day of your group presentation.

Exam

There will be one final exam.

1. The final exam lasts for 2 hours and takes place on the university assigned exam date.
2. Students who miss the exam will not be given "make-up" exams.

Group Formation and Evaluation

Group work plays an essential role in this course. Each group consists of up to six students and is formed on a voluntary basis. Please form your groups on Canvas by **Feb 16**. You can self-sign up for groups by first logging in Canvas ISOM3900 course site, and then clicking People, and then Groups. Since we have two sections, carefully check the group name (which contains the section number) before you join a group.

For both the case study and the term project, all group members receive the same basic scores, which will then be adjusted based on the peer evaluation submitted at the end of the term.

Each team member will assess all **other** team members using the rubric on Group Member Evaluation (GME). Please submit your evaluation on GME by **May 7.**

Academic Honor Code

Personal integrity and professionalism are fundamental values of the university community. To help ensure that these values are upheld and to maintain equitability in the evaluation of your work, this course will be conducted in strict conformity with HKUST Academic Honor Code (https://registry.hkust.edu.hk/resource-library/academic-honor-code-and-academic-integrity). Anyone caught cheating or plagiarizing will fail the course and there will be no acceptable excuses.

Case Report and Term Project Report Scoring Rubric

	2.5	2	1.5	0-1
Identification of the main issues/problems	Identifies and understand all of the main issues in the case/project	Identifies and understand most of the main issues in the case/project	Identifies and understand some of the main issues in the case/project	Identifies and understand few of the main issues in the case/project
Analysis of the issues	Insightful and thorough analysis of all the issues	thorough analysis of most of the issues	Superficial analysis of some of the issues	Incomplete analysis of the issues
Comments on effective solutions/strategies	Well documented, reasoned and pedagogically appropriate comments on solutions, or proposals for solutions, to all issues in the case/project	Appropriate, well-thought-out comments about solutions, or proposals for solutions, to most of the issues in the case/project	Superficial and/or inappropriate solutions or comments to some of the issues in the case/project	Little or no action suggested, and/or inappropriate solutions or comments to all of the issues in the case/project
Links to course readings and additional research	Excellent research into the issues with clearly documented links to class (and/or outside) reading	Good research and documented links to the material read	Limited research and documented links to any reading	Incomplete research and links to any readings

Case and Term Project Presentation Scoring Rubric

	2.5	2	1.5	0-1
Delivery and enthusiasm	Very clear and concise flow of ideas. Demonstrates passionate interest in the topic and engagement with the class	Clear flow of ideas. Demonstrates interest in topic and engagement with the class	Most ideas flow but focus is lost at times. Limited evidence of interest in and engagement with the topic	Hard to follow the flow of ideas. Lack of enthusiasm and interest.
Visuals and staging	Visuals augmented and extended comprehension of the issues in unique ways. Uses stage, effects such as props, costumes, sound effects, in a unique and dramatic manner that enhances the understanding of the issues in the project	Use of visuals related to the materials. Uses stage, effects such as props, costumes, sound effects, in a unique manner to extend understanding of the issues in the project	Limited use of visuals loosely related to the materials. Limited use of stage effects, and/or used in a manner that did not enhance the understanding of the issues in the project.	No use of visuals and stage effects.
Involvement of the class: questions, generating discussion, and activities	Excellent and salient discussion points that elucidated materials to develop deep understanding. Appropriate and imaginative activities used to extend understanding in a creative manner	Questions and discussion addressed important information that developed understanding. Appropriate activities used to clarify understanding.	Questions and discussion addressed surface features of the topic. Limited use of activities to clarify understanding.	Little or no attempt to engage the class in learning.
Response to class queries	Excellent response to student comments and discussion with appropriate content supported by theory/research	Good response to class questions and discussion with some connection made to theory/research.	Satisfactory response to class questions and discussion with limited reference to theory/research.	Limited response to questions and discussion with no reference to theory/research.

Course Outline

Class	Date	Topic
1	2-Feb (Mon.)	Introduction and Overview
2	4-Feb (Wed.)	Decision Tree *Reference: Chapter 14 (ASW)*
3	9-Feb (Mon.)	Value of Information *Reference: Chapter 14 (ASW)*
4	11-Feb (Wed.)	Value of Information (cont.) *Reference: Chapter 18 (HA), Chapter 14 (ASW)*
5	16-Feb (Mon.)	Stochastic Linear Programming *Reference: Chapter 7.7 (BF)*
6	23-Feb (Mon.)	**Case Discussion** **"Buying a House", "Eric Agency",** **"Property Purchase Strategy", "Brainy Business"**
7	25-Feb (Wed.)	Markov Processes *Reference: Chapter 17 (ASW)*
8	2-Mar (Mon.)	Markov Processes (cont.) *Reference: Chapter 17 (ASW)*
9	4-Mar (Wed.)	Markov Processes (cont.) *Reference: Chapter 17 (ASW)*
10	9-Mar (Mon.)	Markov Processes (cont.) *Reference: Chapter 17 (ASW)*
11	11-Mar (Wed.)	Static Games *Reference: Chapter 4 (DSR), Chapter 4 (DN)*
12	16-Mar (Mon.)	Static Games (cont.) *Reference: Chapter 10 (DSR), Chapter 3 (DN)*
13	18-Mar (Wed.)	Mixed Strategies *Reference: Chapters 5&7 (DSR), Chapter 5 (DN)*
14	23-Mar (Mon.)	Mixed Strategies (cont.) *Reference: Chapter 7 (DSR), Chapter 5 (DN)*
15	25-Mar (Wed.)	Dynamic Games *Reference: Chapter 3 (DSR), Chapter 2 (DN)*
16	30-Mar (Mon.)	Strategic Moves *Reference: Chapter 9 (DSR), Chapters 6&7 (DN)*
17	1-Apr (Wed.)	**Case Discussion** **"Pricing Games: Sony PlayStation and Microsoft Xbox",** **"Airbus and Boeing: Superjumbo Decisions"**
18	13-Apr (Mon.)	Statistical Analysis of Decisions with Two Alternatives *Reference: Chapter 10 (BLK)*
19	15-Apr (Wed.)	Statistical Analysis of Decisions with More than Two Alternatives *Reference: Chapter 11 (BLK)*
20	20-Apr (Mon.)	Statistical Analysis of Two Correlated Decisions *Reference: Chapter 11 (BLK)*
21	22-Apr (Wed.)	**Case Discussion: "MotoTech Manufacturing Company"** Project Consultation (by appointment)
22	27-Apr (Mon.)	Final Project Presentations
23	29-Apr (Wed.)	Final Project Presentations
24	4-May (Mon.)	Final Project Presentations
25	6-May (Wed.)	Final Project Presentations/Course Review

Note: The instructor reserves the right to modify the course outline during the term when needed.