ISOM2500 Business Statistics Spring Semester 2024-25

Course Outline

Instructor	Dr. Xinyu Sun Department of Information Systems, Business Statistics, and Operations Management (ISOM)
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Teaching Assistant	Ms. Victoria Zou
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Class Schedule* and Location

L4	3:00 pm – 4:20 pm (Wed & Fri)	Jan 31 – May 10 2024 (except Mar 15 & 29 Apr 3 & 5 May 1)	LSK G012
L5	4:30 pm – 5:50 pm (Wed & Fri)	Jan 31 – May 10 2024 (except Mar 15 & 29 Apr 3 & 5 May 1)	LSK G012

*There are 2 computer lab sessions on top of regular lectures.

Office Hours

- Friday 10:00 am -11:00 am or Zoom Office Hours by appointment with Dr. Xinyu Sun
- Tuesday 1:30 pm - 2:30 pm with Ms. Victoria Zou

Computer Labs

- There will be 2 computer lab sessions on MS Excel. The first one will be held right after Add/Drop period (week 3 or 4) on graphical methods and descriptive statistics. The other one will be scheduled toward the end of the semester on linear regression and other topics.
- Real-time attendance is not mandatory.
- Video records will be uploaded to Canvas

Course Materials

- Lecture Notes, and other teaching materials available on course Canvas in HKUST iLearn (https://ilearn.ust.hk/iLearn/home.html), or HKUST iLearn App on App Store or Google Play
- Recommended Textbook: ***Statistics for Business Decision Making and Analysis*** (2nd ed), Robert Stine, Dean Foster, Pearson (2014)
- Required software: MS Excel (other recommended software: Python or R)

Course Objective

Statistics is a crucial tool in every field that deals with data, including Science, Medicine, Engineering, Business, and more. In today's data-driven world, it's essential to have a solid understanding of statistical concepts and methods to make informed decisions. By the end of this course, you'll be able to:

- Understand basic concepts and methods in statistical thinking and reasoning so that you are able to decide what statistical techniques are most appropriate to use in a given situation, and state their advantages and limitations;
- Know how to interpret and present statistical results that are either self-produced or provided by others;
- Know how to apply both descriptive and/or basic inferential methods in Statistics to solve a real problem in business environment;
- Understand that Statistics is not simply about doing calculations or using statistical software;
- Be prepared to pick up multiple linear regression in your subsequent courses;
- Overcome any anxiety you may have about dealing with data and learning Statistics.

Learning Approach

The learning approach for this course is designed to provide students with a comprehensive understanding of statistical methodology and related concepts. Lectures will be used to introduce these concepts in a relevant context, followed by directed discussions to facilitate the learning process. Attendance at lectures is mandatory.

To further reinforce the material covered in lectures, students are encouraged to read the teaching materials and textbook. This will help consolidate their understanding of the subject matter. Additionally, students are encouraged to proactively and repeatedly engage in problem-solving using exercises and problems from the textbook. This hands-on approach to learning will help students develop a deeper understanding of the material and be better prepared to apply statistical concepts in real-world situations.

Academic Integrity

Without academic integrity, there is no serious learning. All HKUST members (students & staff) should hold a high standard of academic integrity. Academic integrity is of the greatest importance, and thus there should be ZERO tolerance for academic dishonesty in this course. Any violation will lead to serious consequences. Please ensure a strict adherence to the HKUST Academic Honor Code at all times.

(see https://registry.hkust.edu.hk/resource-library/academic-honor-code-and-academic- integrity).

Assessment

Your final grade will be based on the following activities:

1	Midterm Examination**	30%	Closed-book, with help sheet (2 pieces of A4-size paper with any content on both sides) allowed. Mar 19, 8:30 – 9:30 pm
2	Final Examination	50%	Closed-book, with help sheet (2 pieces of A4-size paper with any content on both sides) allowed. **To be determined and announced**
3	Assignment**	15%	There will be 2 sets of homework assignments. All use of generative AI is restricted. Students should form groups of 3 students to finish the assignments jointly. Free-riding or irresponsible behavior may result in lower individual mark. **Group formation should be completed in Canvas by end of Feb 18**.
4	Participation	5%	Classroom participation is crucial to a lively and effective learning environment. Your participation will be assessed according to contributions to in-class discussion.

**Feedback on these assessments will be provided within 10 working days after submission.

Class Schedule

(Tentative)

Part	Session	Date	Topics	Chap.
I Descriptive Statistics	1	Jan 31	Introduction	1,2
	2	Feb 2	Graphical Techniques	3
	3	Feb 7	Numerical Techniques	4
	4	Feb 9	Association and Dependence	5
	5	Feb 14	Association and Dependence	6
II Probability and Random Variables	6	Feb 16	Probability	7
	7	Feb 21	Conditional Probability	8
	8	Feb 23	Discrete Random Variable	9
	9	Feb 28	Discrete Random Variable	11
	10	Mar 1	Continuous Random Variable	12
	11	Mar 6	Continuous Random Variable	12
	12	Mar 8	Continuous Random Variable	12
III Estimation	13	Mar 13	Sampling	13
	14	Mar 15	Midterm Review	
		Mar 19	Midterm (8:30 pm – 9:30 pm)	
	15	Mar 20	Sampling	14
	16	Mar 22	Confidence Intervals	15
	17	Mar 27	Confidence Intervals	15
IV Hypothesis Testing	18	Apr 10	Hypothesis Testing	16
	19	Apr 12	Hypothesis Testing	16
	20	Apr 17	Hypothesis Testing	16
	21	Apr 19	Hypothesis Testing	16
V Simple Linear Regression	22	Apr 24	Simple Linear Regression	19
	23	Apr 26	Simple Linear Regression	19
	24	May 3	Simple Linear Regression	21
	25	May 8	Simple Linear Regression	22
	26	May 10	Final Review	

Course Content

1. Graphical tools
    - bar chart, pie chart
    - histogram, boxplot
2. Descriptive statistics
    - Mean, median, mode, variance, standard deviation, 5-number summary
3. Association and dependence
    - Scatterplot, covariance, correlation, contingency table, Simpson's paradox
4. Probability and conditional probability
    - Experiment, outcome, sample space, event
    - Complement, intersection, union of events
    - Disjoint events, (in)dependent events, collectively exhaustive events, partition
    - Complement rule, addition rule, multiplication rule, law of total probability, Bayes' rule
5. Discrete random variable
    - Basic properties (e.g., pmf, mean and variance)
    - Binomial distribution
    - Properties of expectation (involving linear transformation)
6. Continuous random variable
    - Basic properties (e.g., pdf, area under curve as probability)
    - Uniform distribution
    - Normal random variable – finding probability and percentiles with z table
    - Student's t-distribution

7. Sampling distribution
    - Population, sample, parameter and statistics
    - Sampling distribution of the sample mean
    - Central limit theorem
    - Sampling distribution of the sample proportion
8. Interval estimation
    - Confidence interval for a normal mean (with known or unknown variance)
    - Confidence interval for a proportion
    - Finding (range of) probabilities and percentiles for Student's t-distribution
    - Large-sample confidence interval for a mean from a non-normal population
    - Sample size determination for estimating a mean
9. Hypothesis testing
    - Null and alternative hypotheses, test statistic, rejection region, p-value, Type I and II errors, significance level
    - Z-test (known variance) and t-test (unknown variance) for a normal mean
    - Large-sample Z-test for a proportion
    - Large-sample Z-test for a mean from a non-normal population
10. Simple linear regression
    - Intercept and slope parameters/coefficients, error variance; least square estimation
    - Coefficient of determination
    - Regression assumptions and regression diagnostics
    - Sampling distribution of OLS estimates
    - Interval estimation and hypothesis test of parameters
    - Confidence interval for the mean and prediction interval for a new observation