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**ISOM2500 Business Statistics (L5, L6)**

**Fall Semester 2024**

**Course Outline**

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| InstructorOffice Email | Dr. Xinyu SunDepartment of Information Systems, Business Statistics, andOperations Management (ISOM)LSK 4016Bimxysun@ust.hk |
| Teaching Assistant OfficeEmail | Kenrick YeungLSK 4049Ckenrickyeung@ust.hk |

**Class Schedule[[1]](#footnote-1) and Location**

|  |  |  |  |
| --- | --- | --- | --- |
| **L5** | 12:00 – 13:20 (Mon & Wed) | 2 Sep – 27 Nov 2024 (except 18 Sep) | 6573 |
|  |  |  |  |
| **L6** | 09:30 – 10:20 (Mon & Wed) | 2 Sep – 29 Nov 2024 (except 18 Sep) | 6573 |

**Office Hours**

* Wednesday 14:00 -15:00 F2F or Zoom Meeting by appointment with Dr. Xinyu Sun
* Monday 14:00 – 15:00 F2F or by appointment with Mr. Yeung

**Course Description**

Statistics play an important role in every discipline that utilizes data. The diverse areas involving application of Statistics include Science, Medicine, Engineering, Business, among others. This course is designed to teach fundamental concepts and methods in statistical thinking and reasoning, from which students can understand the business and economic situations, and make informed decision wisely and effectively, when facing data from various sources that quantify relevant information to a problem in the business world.

**Intended Learning Outcomes (ILOs)**

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

ILO1: Understand and master basic theoretical concepts and methods in statistical thinking and reasoning, and be able to decide what statistical techniques are most appropriate to use in a given situation, and state their advantages and limitations.

ILO2: Apply both descriptive and/or basic inferential methods in Statistics to solve a real problem in business environment.

ILO3: Interpret and present statistical results that are either self-produced or provided by others.

ILO4: Be ready to learn multiple linear regression in more advanced courses.

**Assessment and Grading**

This course will be assessed using criterion-referencing and grades will not be assigned using a curve.

*Assessments*:

|  |  |  |
| --- | --- | --- |
| Assessment Task | Contribution to Overall Course grade (%) | Due Date |
| In-class participation | 5 | Full Fall Term 2024 |
| Homework assignment | 15 | Assignment 1: 27 SeptemberAssignment 2: 18 OctoberAssignment 3: 29 November |
| Midterm examination | 20 | 21 October  |
| Final examination | 60 | Fall term examination period; exact date to be announced by AR |

*Mapping of Course ILOs to Assessment Tasks*:

|  |  |  |
| --- | --- | --- |
| Assessment Task | Mapped ILOs | Explanation |
| In-class participation | ILO1 | This task emphasizes on and assesses students’ understanding of the basic concepts in Statistics. |
| Homework assignment | ILO1, ILO2, ILO3, ILO4 | Homework allows students to solve a real problem in business environment, involving formulation of the problem in statistical terms, selection of an appropriate technique to apply in a given situation, analysis of the data, presentation and interpretation of results of the statistical analysis. |
| Midterm examination | ILO1, ILO2, ILO3 | Midterm examination evaluates students’ ability in mastering basic concepts and theory in Statistics, application of descriptive methods, and correct interpretation of statistical results. |
| Final examination | ILO1, ILO2, ILO3, ILO4 | Final examination evaluates students’ ability in mastering basic theoretical concepts, application of both descriptive and inferential methods in Statistics, correct interpretation of statistical results, and understanding the basics of simple linear regression. |

*More information about each Assessment Tasks*:

|  |  |
| --- | --- |
| Assessment Task | More Descriptions |
| In-class participation | * Your participation will be assessed according to contributions to in-class discussion and learning via use of iPRS (available in HKUST iLearn, <https://ilearn.ust.hk/iLearn/home.html>, or HKUST iLearn App on App Store or Google Play) and/or Canvas quiz.
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| Homework assignment | * 3 sets of homework assignments
* All use of generative AI is restricted
* Students should form groups of 3 students to finish the assignments jointly and report via email any free-riding or irresponsible behavior of group members. Once verified, students with such behavior will receive lower individual mark
* **Group formation in Canvas** should be completed by end of **13 Sep**
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| Midterm examination | * Closed-book
* help sheet (2 pieces of A4-size paper with any content on **both sides**) allowed (written, typed or printed)
* Calculator: any kind of physical standalone calculators
* Scheduled on **21 Oct 2024 (MON), 8-9pm**
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| Final examination | * Closed-book
* Help sheet (2 pieces of A4-size paper with any content on both sides) allowed (written, typed or printed)
* Printed Z table and t table if applicable
* Calculator: any kind of physical standalone calculators
* **Date and venue to be announced**
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*Final Grade Descriptors*:

|  |  |  |
| --- | --- | --- |
| Grade | Short Description | Explanation |
| A | Excellent Performance | Demonstrates a comprehensive grasp and understanding of fundamental statistical concepts, selection and application of appropriate descriptive and inferential methods in Statistics, analysis of the data, presentation and interpretation of results of the statistical analysis. |
| B | Good Performance | Shows a good knowledge of fundamental statistical concepts, selection and application of appropriate descriptive and inferential methods in Statistics, analysis of the data, presentation and interpretation of results of the statistical analysis. |
| C | Satisfactory Performance | Possesses an adequate understanding of fundamental statistical concepts, selection and application of appropriate descriptive and inferential methods in Statistics, analysis of the data, presentation and interpretation of results of the statistical analysis. |
| D | Marginal Pass | Has threshold knowledge of fundamental statistical concepts, selection and application of appropriate descriptive and inferential methods in Statistics, analysis of the data, presentation and interpretation of results of the statistical analysis. |
| F | Fail | Demonstrates a lack of understanding of fundamental statistical concepts, insufficient knowledge in selection and application of appropriate descriptive and inferential methods in Statistics, and analysis of the data, and poor skills in presentation and interpretation of results of the statistical analysis. |

**Communication and Feedback**

* All enquiries, other than intellectual questions regarding the teaching and learning materials, in relation to administration of the class (e.g., issues about in-class participation, grading of homework assignment, absence in midterm and final exam, etc.) should be directed to the TA.
* Assessment marks and feedbacks for individual assessed tasks will be communicated via Canvas within 10 days of submission.
* Any discrepancies in assessment marks should be reported to the TA without any delay.

**Late submission Policy**

To ensure fairness for students who submit assignments in Canvas on time, a penalty for late submission according to records in Canvas is listed as follows:

* Late submission within 6 hours: 25% penalty will be applied.
* Late submission between 6 to 24 hours: 50% penalty will be applied.
* Late submission for more than 24 hours will not be accepted.

**Course Materials**

* Class PowerPoints, 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

**Course AI Policy**

The use of Generative AI is permitted and encouraged to assist students in revision and study, except for working on homework assignments.

**Academic Integrity**

Students are expected to adhere to the university's academic integrity policy. Students are expected to uphold HKUST’s Academic Honor Code and to maintain the highest standards of academic integrity. The University has zero tolerance of academic misconduct. Please refer to [Academic Integrity | HKUST - Academic Registry](https://registry.hkust.edu.hk/resource-library/academic-integrity) for the University’s definition of plagiarism and ways to avoid cheating and plagiarism.

**Computer Labs**

* 2 online computer lab sessions hold by TA on MS Excel will be scheduled after the Add/Drop period and toward the end of the semester, respectively. (Tentatively September 19 and November 21)
* Real-time attendance is not mandatory. Video recordings will be available in Canvas.

**Tentative Course Schedule**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Part**  | **Session** | **Date** | **Topics** | **Chap.**  |
| Topic 1 Descriptive Statistics | 1 | September 2 | Introduction | 1,2 |
| 2 | September 4 | Graphical Techniques | 3 |
| 3 | September 9 | Numerical Techniques | 4 |
| 4 | September 11 | Association and Dependence | 5 |
| 5 | September 16 | Association and Dependence | 6 |
| Topic 2Probability and Random Variables | 6 | September 23 | Probability | 7 |
| 7 | September 25 | Conditional Probability | 8 |
| 8 | September 30 | Discrete Random Variable | 9 |
| 9 | October 2 | Discrete Random Variable | 11 |
| 10 | October 7 | Continuous Random Variable | 12 |
| 11 | October 9 | Continuous Random Variable | 12 |
| 12 | October 14 | Continuous Random Variable | 12 |
| Topic 3Inference: Estimation and Confidence Interval | 13 | October 16 | Sampling | 13 |
|  | October 21 | No Class - Midterm  |  |
| 14 | October 23 | Sampling | 13 |
| 15 | October 28 | Confidence Intervals | 14 |
| 16 | October 30 | Confidence Intervals | 15 |
| Topic 3Inference: Hypothesis Testing | 17 | November 4 | Hypothesis Testing | 15 |
| 18 | November 6 | Hypothesis Testing | 16 |
| 19 | November 11 | Hypothesis Testing | 16 |
| 20 | November 13 | Hypothesis Testing | 16 |
| Topic 4Simple Linear Regression | 21 | November 18 | Simple Linear Regression | 16 |
| 22 | November 20 | Simple Linear Regression | 19 |
| 23 | November 25 | Simple Linear Regression | 19 |
| 24 | November 27 | Simple Linear Regression | 21 |

**Course Content**

1. Graphical tools
	* bar chart, pie chart
	* histogram, polygon, boxplot, scatterplot
2. Descriptive statistics
	* Mean, median, mode, variance, standard deviation, 5-number summary
3. Association and dependence
	* Covariance, correlation, contingency table
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 (condition: n ≥ 30)
	* Sampling distribution of the sample proportion
8. Interval estimation
	* Confidence interval (ci) for a normal mean (with known or unknown variance)
	* ci for a proportion
	* Finding (range of) probabilities and percentiles for Student’s t-distribution
	* Large-sample ci for mean of population other than normal
	* Sample size determination for estimating both mean and proportion
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 mean of population other than normal
10. Simple linear regression
	* Intercept and slope parameters/coefficients, error variance
	* Least square estimation
	* Coefficient of determination
	* Regression assumptions
	* Sampling distribution of slope estimate; ci and hypothesis test of slope parameter (not include intercept)
	* ci for a response mean
	* Prediction interval for a new response
1. During the semester, there are 2 computer lab sessions apart from regular lectures. Refer to the end of this document for more information. [↑](#footnote-ref-1)