The Hong Kong University of Science and Technology

UG Course Syllabus

Statistical Inference

MATH 3423

3 credits

Pre-requisites: MATH 2421 OR MATH 2431

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Office Hours: By email appointments

Course Description

This course covers the material about the basic concepts of statistical inference: point estimation and hypothesis testing. The key topics are the sampling from the normal distributions; order statistics; maximum likelihood estimation; properties of point estimators; unbiased estimation; tests of hypotheses; likelihood-ratio tests.

Intended Learning Outcomes (ILOs)

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

No.	ILOs
1.	Understand the main concept of doing statistical inference.
2.	Understand different theoretical properties of sample mean and sample variance.
3.	Understand the new inferential ideas for large sample cases.
4.	Find different estimates with some special estimation techniques they learn in class.

Assessment and Grading

This course will be assessed using criterion-referencing and grades will not be assigned using a curve. Detailed rubrics for each assignment are provided below, outlining the criteria used for evaluation.

Assessments:

Assessment Task	Contribution to Overall Course grade (%)	Due date
Homework assignments	20%	Week 4, 7, 10, 13
Final examination	80%	In the exam period

* Assessment marks for individual assessed tasks will be released within two weeks of the due date.

Mapping of Course ILOs to Assessment Tasks

Assessed Task	Mapped ILOs	Explanation
Homework assignments	ILO1, ILO2, ILO3, ILO4	This task assesses students' ability to explain and apply statistical concepts (ILO 1), evaluate their implications (ILO 2) and (ILO 3) and catch up with the lecture materials to handle different statistical problems in parameter estimation and hypothesis testing (ILO 4).]
Final examination	ILO1, ILO2, ILO3, ILO4	Final examination is designed to access students' foundational understanding of the concepts for statistics inference (ILO 1), evaluate their ability to construct different estimators for different distributions (ILO 4), and their implications (ILO 2) for the use of sample mean and sample variance as well as the application of large sample cases (ILO 3).

Grading Rubrics

Detailed rubrics for each assignment are provided below, outlining the criteria used for evaluation.

a. Examination duration: 3 hrs for Final Examination
b. Percentage of assignments and examination.

Assessment	Assessing Course ILOs
20% by homework (3-4 sets)	1, 2, 3, 4
80% by the final exam	1, 2, 3, 4

*All assignments will receive feedback within 10 working days

Related to the policy on GenAI for teaching and learning, there is No restrictions on use of generative AI for an assessment task.

- For Assignment, no late submission will be accepted.
- If a student misses the final exam, s/he must fill in a form to apply for a make-up final exam with evidence officially.

c. **Grades will be given by criteria referencing**.

Final Grade Descriptors:

Grades	Short Description	Elaboration on subject grading description
A	Excellent Performance	Demonstrates mastery of all theories and results for statistics inference covered in the course and can adapt and apply the statistical approaches to new problems and situations. The student can appropriately apply these concepts to real-world problems, interpret the results accurately, and exhibits strong proficiency in using R for analysis.
B	Good Performance	Shows a solid understanding of the theoretical results in statistical inference discussed in the course. The student can effectively apply these methods to real-world problems and interpret the results with minor errors. Demonstrates good competency in using R for performing analyses.
C	Satisfactory Performance	Possesses adequate knowledge of the core statistical concepts covered in the course. The student can address familiar problems and perform basic analyses using R, though with some inconsistencies. Shows basic ability to interpret results.
D	Marginal Pass	Has a threshold understanding of the fundamental statistical concepts taught in the course. The student can perform simple analyses using R but may struggle with more complex applications. Interpretation of results may be limited and occasionally inaccurate.
F	Fail	Does not have sufficient understanding of even the basics components of the statistical theory covered in the course. The student is unable to effectively apply methods to real-world problems, nor using R for analyses, and fails to interpret results correctly.

Course AI Policy

Students are permitted to consult any person—including the instructor, teaching assistants (TAs), and classmates—for ideas and hints while completing homework assignments. The use of ChatGPT and other generative AI tools is also allowed. However, students are required to write up the solutions independently and are responsible for ensuring that their submissions are correct and comply with University rules and laws, including those regarding plagiarism.

Students are particularly cautioned about the potential inaccuracies and fallacies that may arise from AI-generated answers. Additionally, our final examination will be closed book, meaning that AI tools and resources will not be available during exams. This policy is in place to prevent overreliance on such tools and to ensure that assessments accurately reflect each student's individual understanding and capabilities.

Communication and Feedback

Assessment marks for individual assessed tasks will be communicated via Canvas within two weeks of submission. Feedback on assignments will include [specific details, e.g., strengths, areas for improvement]. Students who have further questions about the feedback including marks should consult the instructor within five working days after the feedback is received.

Required Texts and Materials

There is no textbook. The lecture notes give a concise (to the point) presentation of the course material, usually enough for most students.

Reference Books:

(i) "Statistical Inference" by George Casella and Roger L. Berger

(ii) "Introduction to the Theory of Statistics" by A.M. Mood, F.A. Graybill and D.C. Boes

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 for the University's definition of plagiarism and ways to avoid cheating and plagiarism.