The Hong Kong University of Science and Technology

UG Course Syllabus Template

[Course Title] Multivariate Statistical Analysis

[Course Code] MATH4424

[No. of Credits] 3 Credits

[Any pre-/co-requisites] Statistical Inference (MATH 3423) and Regression Analysis (MATH 3424).

Name: [Instructor(s) Name] Ke Wang

Email: [Your Email Address] kewang@ust.hk

Office Hours: [Specify Office Hours and Location] by appointments, Room 3434

Course Description

This course introduces statistical methods for multivariate data analysis covering Inferences of means and covariance matrices, Hotelling's T test, multiple linear regression, canonical correlation, multivariate ANOVA, principal components analysis, factor analysis, classification, linear and quadratic discriminant analysis.

Intended Learning Outcomes (ILOs)

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

1. Get familiar with multivariate normal distribution, random sample, the distributions of sample mean and covariance, Linear combination of normal random variables;

2. Understand the testing of mean vector, Hotelling's test, Likelihood ratio test, Confidence regions and Large sample inference, Comparing mean vectors from two populations, and one-way MANOVA;

3. Understand the population principal components, Sample variation summarisation;

4. Understand Canonical variates, correlation, interpretation of canonical variables, Sample canonical correlation;

5. Understand classification, Linear and quadratic classification rules, Evaluating classification performance.

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:

Homework: There will be 5 Assignments. Students should submit each homework in form of a clearly written and scanned or a LaTeX-typed PDF on the Canvas system before the deadline. Late homework will not be accepted.

Examination: There will be an 80-minute midterm exam during lecture time (exact date to be confirmed), and a 3-hour final exam arranged by ARO. Under any circumstance, students who are unable to attend the midterm exam will NOT be offered a make-up midterm. The course will follow the make-up exam policy set by ARO for the final exam. Approval from the instructor, the dean, and ARO will be needed for applying for a make-up final exam.

The course total will be calculated by taking the maximum of two schemes in order to encourage students to work harder in the final exam in case the midterm result is not desirable or some student missed the midterm exam:

	Scheme A	Scheme B	Address ILOs
Homework	15%	15%	1, 2, 3,4,5
Midterm	30%	0%	1, 2, 3,4,5
Final	55%	85%	1, 2, 3,4,5
Course Total	100%	100%	

Mapping of Course ILOs to Assessment Tasks

[add to/delete table as appropriate]

Assessed Task	Mapped ILOs	Explanation
Homework	ILO1, ILO2, ILO3, ILO4, ILO5	This task assesses students' ability to understand the statistical methods and their applications in real data examples.
Examinations	ILO1, ILO2, ILO3, ILO4, ILO5	This task assesses students' ability to understand the statistical methods and their applications in real data examples.

Grading Rubrics

Detailed rubrics for each homework will be provided. Paper checking sessions will be provided for midterm and final exams.

Final Grade Descriptors:

Students should aim at getting a course total of 85% or above for A-/A/A+, and about 60% or above for B-/B/B+.

Grades	Short Description	Elaboration on subject grading description
A	Excellent Performance	The student has mastered almost all concepts and techniques of multivariate statistics taught in the course, has excellent understanding of the deepest content of the subject, and acquired workable knowledge for further studies of advanced statistics.
B	Good Performance	The student has mastered the application of the statistical methods taught in this course, yet the understanding of some challenging concepts may not be deep enough for further studies on related advanced subjects.
C	Satisfactory Performance	The student meets the minimum expectation of the instructor, has acquired some basic knowledge of the taught statistical methods, yet some concepts were not clearly understood.
D	Marginal Pass	The student is only able to recall some fragments of topics and is able to apply some of the easiest statistical methods.
F	Fail	The student does not have sufficient understanding of even some fragments of topics, and is not even able to apply some of the easiest statistical methods.

Course AI Policy

The use of ChatGPT or other generative AI is allowed for Assignments only, but needs to be declared in your submissions.

Communication and Feedback

Assessment marks for individual assessed tasks will be communicated via Canvas within two weeks of submission. Students who have further questions about the feedback including marks should consult the instructor and TA within five working days after the feedback is received.

Resubmission Policy

Late submissions and resubmissions of homework are not allowed.

Required Texts and Materials

Lecture notes and slides (on Canvas)

Textbook: Johnson and Wichern, Applied Multivariate Statistical Analysis, Sixth Edition (not required.)

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.

[Optional] Additional Resources

[List any additional resources, such as online platforms, library resources, etc.]