Course Syllabus for MATH2121
Spring 2025-2026

Course Title: Matrix Algebra and Applications

Course Code: MATH2121

No. of Credits: 3

Prerequisites

A passing grade in AL Pure Mathematics / AL Applied Mathematics; MATH 1014 or MATH 1018 or MATH 1020 or MATH 1024

Exclusions

MATH 2111, MATH 2131, MATH 2350

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Course Description

This is a fully fledged course on linear algebra for year-one students. We shall cover topics on systems of linear equations, matrices, determinants, vectors in n-dimensional spaces, linear transformations, change of basis, eigenvalues and eigenvectors, diagonalization, inner products, orthogonal projection, Gram-Schmidt process, diagonalization of symmetric matrices and quadratic forms.

Intended Learning Outcomes (ILOs)

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

1. Explain the core theories and concepts of a system of linear equations.

2. Manipulate the basic algebra and computation techniques of matrices and determinants.

3. Describe the basic terminologies that appeared in vector spaces and inner product spaces.

4. Formulate the concept and properties of eigenvalues and eigenvectors of a matrix.

5. Operate the diagonalization process and the Gram-Schmidt process, and learn their applications.

6. Be able to solve linear least-square problems

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:

There are homework assignments, made on a weekly basis, midterm exam and final exam.

Assessment Task	Contribution to Overall Course grade (%)	Due date
Weekly homework	20%	
Midterm exam	30%	31/03/2026

Final examination	50%	

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

Mapping of Course ILOs to Assessment Tasks

[add to/delete table as appropriate]

Assessed Task	Mapped ILOs	Explanation
Homework	ILO1, ILO2, ILO3, ILO4, ILO5	Through finishing homework assignments, students learn enhance their understanding of course materials to the extent of being able to solve relevant linear algebra problems.
Midterm Exam	ILO1, ILO2, ILO3, ILO4, ILO5	The midterm exam presses the student to review course materials thoroughly and rigorously, and demonstrate their ability to solve typical linear algebra problems.
Final Exam	ILO1, ILO2, ILO3, ILO4, ILO5	The same as above

Grading Rubrics

[Detailed rubrics for each assignment will be provided. These rubrics clearly outline the criteria used for evaluation. Students can refer to these rubrics to understand how their work will be assessed.]

Final Grade Descriptors:

[As appropriate to the course and aligned with university standards]

Grades	Short Description	Elaboration on subject grading description
A	Excellent Performance	Deliver excellent performance in homework, midterm and final exam. Through the course work, demonstrate a correct and comprehensive understanding of the theories taught.
B	Good Performance	Have a good understanding of the theories. Have a good performance on most course work.
C	Satisfactory Performance	Have an adequate understanding of the theories. Have a fair performance in course work.
D	Marginal Pass	Have acquired the basic concepts of the theories. Have delivered a performance in course work to achieve a basic understanding of the theories.
F	Fail	Have delivered a very poor overall performance in course work. Demonstrate the failure to understand the basic concepts of the theories. Considered necessary to retake the same course, if possible.

Course AI Policy

Students are encouraged to finish homework independently, using large linguistic models (LLM) only for helps. But AI tools are not allowed for exams.

Communication and Feedback

Assessment marks for individual assessed tasks will be communicated via offline tutorial sessions. Students are encouraged to see instructor and tutors for questions or clarification of scoring/grading. A paper checking session will be offered after final the exam.

Resubmission Policy

With credible justifications, students can be grated late submission of homework, or make-up exam for midterm and final.

Required Texts and Materials

Textbook: David C. Lay et al., *Linear Algebra and its Applications*, Fifth Edition, Pearson.

Lecture notes are posted on the course webpage under Canvas

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

Introduction to Linear Algebra Links to an external site. by Gilbert Strang (for applications/intuition).

Linear Algebra Done Right Links to an external site. by Sheldon Axler (for theory).