Math 2111 Matrix Algebra and its Applications
Course Outline - spring 2026

1. Course Instructor

Name: Dr. Hon-Ming HO
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Office Hour: Tuesday from 12:00 pm to 2:00 pm

2. Teaching Assistant

Name: ZHENG, Jinyang
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Name: MAO, Jianda
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Name: KONG Hoi Sang
Contact Details: Room 3012, e-mail: mahsk@ust.hk

3. Meeting Time and Venue

Lecture: L1: Wednesday and Friday 1:30 pm-2:50 pm, Room 4620
Tutorials: T1a: Wednesday 09:30-10:20 Room LG3008
Tutorials: T1b: Tuesday 16:30-17:20 Room 5402
Tutorials T1c: Wednesday 12:00-12:50 Room 2463
Lecture: L2: Monday 1:30 pm -2:50 pm, Friday 9:00 am-10:20 am Room 2465
Tutorials: T2a: Friday 1:30 pm-2:20 pm Room 6602
Tutorials: T2b: Friday 10:30 am-11:20 am Room 1410
Tutorials: T2c: Monday 18:00-18:50 Room CYTG001

4. Course Description

- Credit Points: 3 units
- Pre-requisite: A passing grade in AL Pure Mathematics/AL applied Mathematics; or Math 1014; or Math 1018; or Math 1020; or Math 1024
- Exclusion: Math 2121, Math 2131, Math 2350
- Brief Information/Synopsis:
  Systems of linear equations, vector spaces, linear transformations, matrix representation of linear transformations, eigenvalues, eigenvectors, inner product spaces.

5. Intended Learning Outcomes

Upon successful completion of this course, students should be able to do:

No.	ILOs
1	Develop an understanding of the core ideas and concepts of matrix algebra, linear transformations, eigenvectors and inner product spaces
2	Recognize the power of abstraction and generalization, carry out mathematical work with independent judgement,
3	Apply rigorous, analytical and numeric approach to analyze and solve problems using concepts of linear algebra,
4	Communicate problem solutions using correct mathematical terminology and good English.

6. Assessment Scheme

a) **This course will be assessed by using criterion-referencing, based on students' performance in assessment tasks/activities, and the course grades will NOT be assigned by using a curve.**

b) Examination duration: 2 hours **(provisional)** for the mid-term examination (closed book exam, no calculators), 2.5 hour **(provisional)** for the final examination (closed book exam, no calculators).

c) Percentage of coursework, examination

Assessment	Assessing Course ILOs
18% by online homework assignment	1, 2, 3, 4
28% by mid-term examination	1, 2, 3, 4
54% by final examination	1, 2, 3, 4

d) Grade descriptors:

Grades	Short Descriptions	Elaboration on subject grading description
A+, A, A-	Excellent Performance	The student has mastered ***all concepts and techniques of linear algebra taught in this course***, has excellent understanding of the deepest content of the subject, and acquired workable knowledge for further studies of higher-level mathematics courses.
B+,B,B-	Good Performance	The student has mastered ***most computational techniques of linear algebra taught in this course***, yet the understanding of some challenging concepts may not be deep enough for further studies on related advanced subjects.
C+,C,C-	Satisfactory Performance	The student meets the minimum expectation of the instructor, has acquired ***some basic computational techniques of the subject***, 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 complete some of the easiest computations.
F	Fail	The student does not have sufficient understanding of even some fragments of topics, and is not even able to complete some of the easiest computations.

7. 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.
- Make-up Exam Policy: The make-up mid-term exam will only be considered with *at least a 6-hour notice in advance* and with proper supporting documents before the regular exam session. The make-up final examination will follow the make-up exam policy set by ARO.
- Course AI policy: The use of Generative AI is permitted to use when doing homework. Students should be critical of the response generated by AI and do not blindly copy the generated responses to your homework.

8. Student Learning Resources

- *Lecture notes*: Lecture notes will be distributed on every lecture.
- *Textbook*: **Linear Algebra and its Applications by David C. Lay, 5th edition. Pearson.**
- *Math Support Center:* Learning support provided by Mathematics Department (http://www.math.ust.hk/~support)

9. Teaching and Learning Activities

Scheduled activities: 3 hours (lecture) + 1 hour (tutorial).

Lecture will focus on illustrating the concepts of the course content, while tutorials will focus on examples and problem skills.

10. Course Schedule (provisional)

Week	Key Topics
1, 2, 3	Systems of linear equations, Row reduction and echelon forms, Homogeneous linear systems and solution structure, Matrix Transformations, Matrix operations, Matrix Inverses
4, 5, 6,7	Elementary Matrices, Determinants and its properties, Cramer's Rule and inverse formula, Areas and Volumes, Vector Spaces and Subspaces, Subspaces associated with matrices, Linear Independent Sets and Bases, Coordinate Systems and dimension
8 ,9, 10	Rank theorem, Eigenvectors, Eigenvalues and their applications, Homogeneous Systems of First Order Linear ODEs,
11 ,12, 13	Inner Product Spaces, Orthogonality and orthonormal sets, Orthogonal projections and Gram-Schmidt process, Least square solutions and Applications