MATH 2101 LINEAR ALGEBRA I, FALL SEMESTER 2025

0.1. **Basic information.**

- Lecturer: Prof. Kei Yuen, CHAN
- Office: Run Run Shaw Building, Room 418
- Email: kychan [AT] maths.hku.hk
- Lectures: Monday 14:00-14:50 and Wednesday 11:00-12:50 at Rm 101, KKL Building
- Consultation hours:

- Teaching Assistant: Dr. Chiu Yin, TSANG
- Office: Run Run Shaw Building, Room 310
- Email: h0347529 [AT] connect.hku.hk
- Consultation hours:

- Teaching Assistant: Mr. Peng, ZHOU
- Office: Run Run Shaw Building, Room 320B
- Email: zhpmath [AT] connect.hku.hk
- Consultation hours:

- Course Webpage at HKU Moodle
- Tentative Tutorial Schedules: Thu 16:00-16:50 MB201, Fri 14:00-14:50 TT403, Fri 15:00-15:50 MB-G07

0.2. **Topics covered.**

- Matrix Algebra: Matrix addition and multiplication, determinant and inverse of square matrices, system of linear equations as a matrix equation. (1.5 weeks)
- Systems of Linear Equations: Gauss-Jordan elimination, elementary row operations, row echelon form, elementary matrices, matrix inversion. (2 weeks)
- Vector Spaces: Coordinate system in $\mathbb{R}^n$, the Euclidean spaces as vector spaces, its subspaces, span of vectors, linear independence, basis, dimension, applications. (2 weeks)
- Linear transformations: Definition and examples of linear transformations between Euclidean spaces, matrix representations, and change of coordinates. (1.5 weeks)
- Eigenvalue Problem: Eigenvalues and eigenvectors, diagonalization of matrices, applications. (2 weeks)

- Inner Product: Gram-Schmidt process, least square problems and orthogonal matrices. (2 weeks)

0.3. **References.**

- Lecture Notes
- Reference book: S. Fridberg, A. Insel and L. Spence, Linear Algebra 4th/5th Editions

We do not follow the approach of the reference book, but the book covers those topics. Students that need lots of practice problems are highly encouraged to buy the reference book. Lectures will not be recorded.

0.4. **Assessments.**

(1) Assignments (10%)
(2) Examination (50%)
(3) Tests (40%)

0.5. **Calculators.** A calculator is not needed in the course. Calculators are **not** allowed in any tests or exam.

0.6. **Tentative Schedule.** Teaching period: 1st September-29th November

Week	Topic	Remarks
1/9-5/9	Matrix Alg.	
8/9-12/9	System of Linear Eqns	
15/9-19/9	System of Linear Eqns	
22/9-26/9	Vector Spaces	
29/9-3/10	Vector Spaces	No-class 1/10
6/10-10/10	Vector Spaces	
13/10-17/10	Reading Week	
20/10-24/10	Linear transformations	Test 20/10
27/10-31/10	Linear transformations	No class 29/10
3/11-7/11	Eigenvalue Problem	
10/11-14/11	Eigenvalue Problem	
17/11-21/11	Inner Product	
24/11-28/11	Inner Product	Terst 24/11

0.7. **Expectations to students.**

- This is a very difficult and heavy-workload course designed for Math major students and will focus on both conceptual and practical aspects. I expect students work hard for classes, and spend hours to go through details of lecture notes and work on practice problems after lectures. Assignments and tests are usually more difficult than lectures. Successful students should be able to link topics in the course and reorganize the subject at the end of the course.

- Theorems shown in-class and other course pre-requisites can be in general used to answer questions in assignments, tests and exams (unless the question is to ask you to work in specific methods or has specific requirements). Students who would like to use concepts or materials not yet covered in the course have to provide sufficient explanations for full credits.

0.8. **Assignments.** Assignments will be given about every one or two weeks. Late submission for an assignment has to be approved by a teaching assistant. No late submissions are allowed after solutions are posted or discussed. The assignments will be scored zero for no submission.

0.9. **Tests.** Two tests have equal weighting. Make-up tests will only be given in rare circumstances such as mandatory university events. Reasons such as personal or association commitments are not entertained. A written request with supported documents for missing a test should be provided as soon as possible before a test.

0.10. **Plagiarism.** Students have to **read carefully** the consequences of plagiarism: https://tl.hku.hk/plagiarism/

0.11. **Tutorials and lectures.** There will be a weekly tutorial starting from the week of 15 September. Active participation for tutorials and lectures is highly encouraged. Students who actively contribute a good learning environment in class or tutorials will be considered an improvement in the grade when they are in marginal cases.