Math 2121 Linear Algebra – Fall 2024

1. **Instructors**
   Eric Marberg (emarberg@ust.hk)

2. **Teaching Assistants**
   T1A: CUI, Daorong (dcuiab@connect.ust.hk)
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   T2A: FENG, Yaxin (yfengba@connect.ust.hk)
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   T2C: HE, Jiayi (jhecy@connect.ust.hk)
   T2D: JIN Tianyu (tjinac@connect.ust.hk)

3. **Lecture Time and Venue**
   (L1) Tuesdays and Thursdays 15:00 - 16:20 in CYTG 010
   (L2) Tuesdays and Thursdays 10:30 - 11:50 in CYTG 010

4. **Exclusion(s)**: MATH 2111, MATH 2131, MATH 2350

5. **Prerequisite(s):** A passing grade in AL Pure Mathematics / AL Applied Mathematics; OR MATH 1014 OR MATH 1018 OR MATH 1020 OR MATH 1024

6. **Topics:** Solving linear systems, vector spaces, matrices, linear mappings and matrix forms, inner products, orthogonality and Gram-Schmidt process, eigenvalues and eigenvectors, symmetric matrices and diagonalization, determinants.

7. **Intended Learning Outcomes**
   Upon successful completion of this course, students should be able to:

No.	Intended Learning Outcome
1	Develop an understanding of the core ideas and concepts of vector spaces, and be familiar with linear mappings and matrix forms.
2	Be able to solve system of linear equations by using row operations and reduced row echelon forms and tell existence and uniqueness of solutions of a linear system
3	Understand the concept and properties of determinant and matrix operations and be able to obtain eigenvalues and eigenvectors of a matrix or a linear transform.
4	Be able to operate the Gram-Schmidt process and be able to diagonalize a matrix

8. **Assessment Scheme**
   a. Examination Duration: 2 hours (midterm), 3 hours (final)
   b. Percentage of coursework, examination, etc:

Assessment	Assessing Course ILOs
10% by homework	*1,2,3,4*
30% by midterm examination	*1,2,3,4*
60% by final examination	*1,2,3,4*

The course will be assessed using criterion-referencing, according to these grade descriptors:

A (Excellent Performance)
The student has mastered almost all concepts and techniques of linear algebra taught in the course, has excellent understanding of the content of the subject, and can solve almost all questions on the main examinations and homework assignments.

B (Good Performance)
The student has mastered most computational techniques of linear algebra taught in the course, but has only adequate understanding of some challenging concepts, and is unable to solve the most difficult examination questions.

C (Satisfactory Performance)
The student meets the minimum expectation of the instructor, and has acquired some basic computational techniques of linear algebra, but is unable to understand a significant number of of important concepts.

D (Marginal Pass)
The student is only able to understand some fragments of the main topics and can only complete the easiest computations on examinations and homework assignments.

F (Fail)
The student does not have sufficient understanding of even the most basic course topics, as reflected by very poor performance on examinations and lack of effort on homework assignments.

9. Teaching and Learning Activities

a. Lectures focus on understanding concepts, theory and applications
b. Tutorials focus on homework assignments

10. Textbook: Linear Algebra and its Applications, by D. Lay, etc. (6th edition)

11. Midterm: TBA (2 hours).
Final: TBA (3hours)

12. Course Schedule:

Chapter 1: Linear Equations in Linear Algebra
1.1 Systems of Linear Equations
1.2 Row Reduction and Echelon Forma
1.3 Vector Equations
1.4 The Matrix Equation $\mathbf{A}x=b$
1.5 Solution Sets of Linear Systems
1.7 Linear Independence
1.8 Introduction to Linear Transformations
1.9 The Matrix of a Linear Transformation

Chapter 2: Matrix Algebra
2.1 Matrix Operations
2.2 The Inverse of a Matrix
2.3 Characterizations of Invertible Matrices

Chapter 3: Determinants
3.1 Introduction to Determinants
3.2 Properties of Determinants

Chapter 4: Vector Spaces
4.1 Vector Spaces and Subspaces
4.3 Linearly Independent Sets; Bases
4.4 Coordinate Systems