

Math111 – Linear Algebra – Fall 2006

Brief Outline: 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 \mathbb{R}^n , linear transformations, change of basis, eigenvalues and eigenvectors, diagonalization, inner product, orthogonal projection, Gram-Schmidt process, orthogonal diagonalization of symmetric matrices, and quadratic forms, etc. If time permits, we may add some more details to each topic. The A Level Pure Math or A Level Applied Math is required.

Instr/Tutor	Office	Lecture/Tutorial Hour	Venue
Chen, Beifang	Rm 3470	L2, Tue, Thu 15:00pm-16:20pm Office hour: Wed, 2:00pm-4:00pm	Rm 2306
Leung, Kin-Kwan	Rm 3213	T2a, Wed, 17:00pm-17:50pm T2b, Mon, 18:00pm-18:50pm Office hour: Mon, 3:00-5:00pm	Rm 2407 Rm 4502

Textbook: **Linear Algebra and Its Applications** (Third edition)
by David C. Lay & Addison-Wesley 2003

Homework: Homework will be given biweekly on-line. The TA will be responsible to collect and partly grade each homework, and keep the records. The deadline for each homework will be decided by the TA. It is crucial to do all homeworks to understand the subjects.

Exams: There are midterm and final exams. Everyone must write the two exams without exception. Anybody who failed to attend the final exam will automatically get F grade, regardless his/her homework and midterm exam.

Grading: Homework and quizzes 10%; midterm exam 25%; final exam 65%.

Tentative Schedule

Week 1-3	Linear Equations in Linear Algebra
1.1	System of Linear Equations
1.2	Row Reductions and Echelon Forms
1.3	Vector Equations
1.4	The Equation $A\mathbf{x} = \mathbf{b}$
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
Week 3-6	Matrix and Determinants
2.1	Matrix Operations

2.2	Inverse of a Matrix
2.3	Characterization of Invertible Matrices
2.8	Subspaces of \mathbb{R}^n
2.9	Dimension and Rank
3.1	Introduction to Determinants
3.2	Properties of Determinants
3.3	Cramer's Rule, Volume, and Linear Transformations
Midterm Exam	9 Oct. 2006, venue and time to be arranged
Week 6-8	Vector Spaces
4.1	Vector Spaces and Subspaces
4.2	Null Spaces, Column Spaces and Linear Transformations
4.3	Linear Independent Sets and Bases
4.4	Coordinate Systems
4.5	Dimension of a Vector Space
4.6	Rank
4.7	Change of Basis
Week 9-12	Eigenvalues, Eigenvectors and Orthogonality
5.1	Eigenvalues and Eigenvectors
5.2	The Characteristic Equation
5.3	Diagonalization
6.1	Inner Product, Length and Orthogonality
6.2	Orthogonal Sets
6.3	Orthogonal Projections
6.4	Gram-Schmidt Process
6.5	Least-Squares Problems
6.7	Inner Product Spaces
Week 12-14	Symmetric Matrices and Quadratic Forms
7.1	Diagonalization of Symmetric Matrices
7.2	Quadratic Forms
7.3	Constrained Optimization
Week 14	Review
Final Exam	To be arranged by ARR Office