Math113 – Introduction to Linear Algebra – Spring 09

Brief Outline: This is an introductory course on *linear algebra* for year one students. We will cover topics on systems of linear equations, matrices, determinants, vectors in $\mathbb{R}^n$, linear transformations, eigenvalues and eigenvectors, diagonalization, inner product and orthogonal projections, etc. If time permits, we shall add the topic of diagonalization of symmetric matrices. The A Level Pure Math or A Level Applied Math is required.

Instr/Tutor	Office	Lecture/Tutorial Hour	Venue
Chen, Beifang	3470	L1, Wed, Fri, 2:00pm–2:50pm	LTF
		L2, Mon, 5:00pm-5:50pm	2407
		L2, Fri, 12:30pm-13:20pm	2407
		Office Hours: Mon, Wed, 3–4pm	
Ma, Kai	3213	T1a, Mon, 3:00pm–3:50pm	4503
		T1b, Tue, 7:00pm-7:50pm	4503
		Office Hours: Mon, 4:30pm-5:30pm	
		Thur, 5:00pm-6:00pm	
Wang, Yihua	3215	T2a, Thur, 1:30pm-2:20pm	4619
		T2b, Fri, 1:30pm-2:20pm	4503
		Office Hours: Tue, 12:00pm-2:00pm	

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

Homework: There are four homework sets. The TA will be responsible to collect and partly grade each homework, and keep the records. Each homework set may be divided by the TA into 2 or 3 parts to be handed in; the deadline for each part of the homework will be decided by the TA. It is crucial to do all homeworks to understand various concepts, formulas, and theorems.

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, no matter how well he/she did for the homework and the midterm exam.

Grading: Homework and quizzes 10%; midterm exam 35%; final exam 55%.

Intended Learning Outcomes

1. Be able to explain the core ideas and concepts of Linear Algebra at the college level;

2. Be able to apply rigorous, analytic, highly quantitative (even numerical) approach to analyze, build up models (execute tasks) and solve problems that need the knowledge of linear algebra in other subjects in college study and at work in the future;

3. Be able to apply the power of abstraction, universality, and succinctness of linear algebra to carry out investigations of various problems with linear properties or having near linear properties.

4. Be able to communicate effectively to both layman and experts, if applicable, utilizing the knowledge of linear algebra.

Tentative Schedule

Week 1-4	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 $A\boldsymbol{x} = \boldsymbol{b}$
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 4-6	Matrix and Determinants
2.1	Matrix Operations
2.2	Inverse of a Matrix
2.3	Characterization of Invertible Matrices
3.1	Introduction to Determinants
3.2	Properties of Determinants
3.3	Cramer's Rule, Volume, and Linear Transformations
Midterm Exam	Wed, March 18, 2008; 7:00pm–8:30pm, venue to be arranged
Week 7-10	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
Week 10-14	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
Week 14	Review
Final Exam	To be arranged by ARR Office