MATH 4373/5373–Section 001 Abstract Linear Algebra
Information Sheet

This handout contains important information about Mathematics 4373/5373, Section 001, for the Fall Semester 2000. It is your responsibility to acquaint yourself with all the information in this handout, and with any modifications to it that may be announced in class.

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Office Hours: Mon. 11:30–12:30, Tue. 12:30–1:30, Thu. 11:00–12:00.

Prerequisites: Math 3333 (Linear Algebra).

Recommended Reading:

- *Linear Algebra,* (2^{nd} ed.) by Kenneth Hoffman and Ray Kunze, Prentice-Hall, 1971.
- *Linear Algebra: An introduction to abstract mathematics,* by Robert J. Valenza, Springer-Verlag [UTM Series], 1993.
- *Finite-Dimensional Vector Spaces,* by Paul R. Halmos, Springer-Verlag [UTM Series], 1974.
- *Linear Algebra,* by Serge Lang, Addison-Wesley, 1966.

While the lectures will try to remain self-contained throughout the course, you should attempt examples and do reading on your own. The four books listed above are all on reserve in the Math-Chem library on the 2nd floor of PHSC. You will also find other Linear Algebra books in the **QA183-4** and **QA251** sections of the Math-Chem library.

Comments: We have already encountered motivating examples of vector spaces in Calculus and introductory Linear Algebra courses. So we'll pretty much start from the definition of a vector space and a linear mapping. That is not so say that we'll skip over examples in this course. Far from it: studying concrete examples is a very important way of understanding (and often of developing new) concepts in mathematics. Keep this in mind as you progress through the course. If ever a theorem or result seems hard to comprehend or appears to be un-intuitive, then you should try to see what it says in the simplest cases. Then you can work up to more complicated instances until you feel comfortable with the form and scope of the general statement.

Syllabus: For a really general overview of our course, you should take a look at the table of contents of the book by Halmos. The first three chapters are called **spaces** (where one encounters vector spaces, subspaces, dual spaces, direct sum decompositions etc), **transformations** (where one learns about linear transformations on vector spaces, the algebra of linear transformations, linear transformations and subspaces, linear transformations and dual spaces, matrices and linear transformations, similarity, triangular form, Jordan and rational forms), and **orthogonality** (where one learns about inner product spaces, orthonormal bases, the dual space and inner products, self-adjoint transformations, normal transformations, spectral theorem, classifications of bilinear forms, Sylvesters law, isometries, orthogonal and unitary operators).

Our approach will be to begin with a quick overview of the main points of Math 3333. This means we'll talk about vector spaces, linear transformations, and matrices before talking about dual spaces for example. Here is our outline, with a list of the corresponding chapters of Hoffmann-Kunze. You'll have encountered all of Part 1 (with possible exception of dual spaces) in Math 3333.

Part 1: Basics (Chapters I–III & V of H-K) Vector spaces, Linear transformations, Matrices, Dual spaces, Determinants.

Part 2: Structure of L.T.s (Chapters IV, VI & VII of H-K) Facts from algebra of polynomials, eigenvectors/values, characteristic polynomials, primary decomposition, rational and Jordan canonical forms.

Part 3: Inner products (Chapters VIII–X of H-K) Inner product spaces, dual spaces revisited, self-adjoint, unitary and normal operators, spectral theory, structure of bilinear forms, Sylvesters law.

Part 4: Miscellaneous topics Linear groups and geometry.

Lectures: You are expected to attend all lectures, and are responsible for all information given out during them. In particular, this includes any changes to the midterm dates or content.

Grading Scheme: Grades will be assigned by weighting the totals from your Homeworks, Midterms, and Final Examination as follows:

Homeworks	26%
Midterms (3×16)	48%
Final Examination	26%

Here is the grading scale used in the course.

$$A \quad 85-100\%; \quad B \quad 70-84\%; \quad C \quad 55-69\%; \quad D \quad 40-54\%; \quad F \quad 0-39\%.$$

Here is a detailed description of each of the components listed above.

Homework: Homework will be due at the **start** of class on Tuesdays. Homework assignments can be found on the Homework Sheets which will be posted on the web page as the semester progresses. Minor modifications to the homework sheets may be announced in class during the semester.

Midterms: There are three midterms; two in-class examinations and one take home exam/project. Here are the relevant dates.

Midterm 1: [in class] Thursday, September 21.

Midterm 2: [in class] Thursday, October 26.

Midterm 3: [due date] Thursday, November 30.

Final Examination: The final examination is cumulative. It is scheduled for Monday, December 11, 1:30pm–3:30pm in PHSC 121.

Taking Examinations: Here are a few notes on taking Examinations.

- I will hold extra Office Hours and schedule Review Sessions before the Midterms and Final Examinations. You are strongly encouraged to attend the Review Sessions, and to attend Office Hours regularly.
- You cannot use calculators/computers, books or any type of notes during the examinations.
- All examinations must be taken at scheduled times, except in *very extreme circumstances.* So be careful not to make travel arrangements that conflict with examination times. If you cannot take an examination at a scheduled time, you should contact me *well in advance of the test time.* Otherwise, an absence at an exam will result in a score of zero.

Policy on W/I Grades: Until September 1 there is no record of grade for dropped courses. From September 5 through September 29, you may withdraw and receive a W grade, *no matter what scores you have so far achieved*. From October 2 through October 27 you will need my permission to withdraw. From October 30 on, University regulations specify that you may withdraw only with the permission of the Dean.

Students who are failing the course should **not** expect to be able to receive an I grade in place of an F. I will only consider giving an I grade if the student is already maintaining a passing grade in the course, has completed most of the work in the course (for example, all but the final examination), and can demonstrate that they are unable to complete the work at this time due to circumstances beyond their control.

Academic misconduct: The following is taken from the University Academic Misconduct Code. *It is the responsibility of each instructor and each student to be familiar with the definitions, policies, and procedures concerning academic misconduct.*

Cases of academic misconduct are inexcusable. Don't do it. All cases of academic misconduct will be reported to the Dean of Arts and Sciences for adjudication.

Accommodation of Disabilities: Any student in this course who has a disability that may prevent him or her from fully demonstrating his or her abilities should contact me personally as soon as possible to discuss the accommodations necessary to facilitate his or her educational opportunity and ensure his or her full participation in the course.