

**APPLIED LINEAR ALGEBRA**  
**Math 4350/5350/7350 Syllabus Spring 2008**

**Space-Time:** RH 1561 MWF 1-1:50pm

**Instructor:** Mao-Pei Tsui

**Office Hours:** UH2080B M 10:00-11:00am, W 2:00-4:00pm, F 10:00-11:00am

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**Homepage:** <http://www.math.utoledo.edu/~mtsui/>

**Class Web Site:** <http://www.math.utoledo.edu/~mtsui/4350sp08/4350.html>

**Text:** *L.N. Trefethen and D. Bau, Numerical linear algebra, SIAM, Philadelphia, PA, 1997.*  
ISBN: 0-89871-361-7

**Prerequisites:** MATH 1890 and 2890.

The prerequisite for this course is elementary linear algebra, including the following.

- Systems of equations: solution by LU-factorization (Gaussian elimination).
- Vector spaces: basis, dimension, linear independence, subspaces, and linear span.
- Linear transformations: kernel, image, rank, and nullity.
- Matrix of a linear transformation: row space, null space, column space, and change of basis.
- Eigenvalues, eigenvectors, and diagonalization (Jordan canonical form).

If you have never seen most of these concepts before then you are not ready to take this class. However, if you have seen most but not all, or seen them all but have forgotten most, then you should be able to succeed in this class, altho you will have to work hard at the beginning to refresh your memory and fill in any gaps.

**Homework:** Typically, homework will be assigned weekly and collected at the beginning of the class on the due date. Assignments and their due dates will be posted on this course website. Late assignments will not be accepted unless in extraordinary circumstances. Your solutions must be neat and show all work. If you do not show your work then you will not receive credit for your solution. I will drop your two lowest homework scores.

**Quizzes:** Throughout the semester, there will be several 15 minute quizzes given during class, the dates to be announced in advance. The material in the quizzes will be drawn from the homework and suggested problems selected for the previous week. The lowest quiz score will be dropped.

**Exams:** We will have two in-class one hour midterm exams, and a two hour final exam.

- Midterm I Feb. 11 (Monday)
- Midterm II Mar. 24 (Monday)
- Final Exam April 30 (Wednesday), 12:30-2:30

The final exam is comprehensive and will slightly place more emphasis on the material covered after the last in-class exam.

**Missed Quizzes and Exams:** Absences for quizzes and exams can only be excused if covered by the University's missed class policy. The policy specifically mentions absences from class may be excused for personal emergencies, religious observances, participation in certain UT sponsored activities, and government required activities. For more information see <http://www.utoledo.edu/index.asp?id=529>. Arrangements for make up quizzes and exams will only be made if you inform me of the absence without delay by phone or email and present a documented excuse.

**Grading:** The following percentages are assigned to the components of the student's grade.

Quizzes	10%
Hand in homework	15%
Exam I	20%
Exam II	20%
Final Exam	35%

In computing the quiz grade the lowest quiz score will be dropped.

Your final grade will be determined from the distribution of total points earned, on the following scale: 90-100% earns an A; 80-89% earns a B; 70-79% earns a C; 60-69% earns a D. The IW grade will be given to only those students who have stopped attending class before or on March 24. If you have any question about your grade at any time please speak with me.

**Resources:** There are resources available for students who need extra help outside of my office hours. For this courses the most reliable source of tutorial help can be found at the Mathematics Learning and Resource Center located in the basement of Carlson Library(adjacent computer lab).

**Goals:**

At the end of the course, students should be able to

- make calculations with agility, accuracy, intelligence and flexibility
- explain the basic concepts clearly and reason logically with them.

**Expectations :**

To achieve these goals, students are expected to

- read each section of the textbook before the material is presented in class
- attend the lectures
- complete all homework assignments
- discuss mathematics with other students and the instructor

**Calendar:**

Martin Luther King Day	January 21
Last date to drop	January 22
Exam I	Feb. 11 (Monday)
Spring Break	Mar. 3 - Mar. 7
Last date to withdraw	Mar. 21 (Friday)
Exam II	Mar. 24 (Monday)
Final exam	April 30 (Wednesday), 12:30-2:30

**Course outline:** We plan to cover the following topics, found in Chapter I to Chapter V of the textbook by Trefethen and Bau.

- Fundamentals. Matrix Norms, Condition Numbers, Stability.
- Decompositions. Singular Value Decomposition, QR factorization, Schur Decomposition.
- Eigenproblem. Reduction to Hessenberg form, Rayleigh quotients, Inverse Iteration, QR algorithm, QR with shifts, Jacobi Method.