Course Syllabus: Matrix Theory
Summer 2012

Course Prefix/Number: MAS 5145 - 6044 (In class), MAS 5145 - 6051 (online)
Course Title: Matrix Theory
Course Credit Hours: 3
Instructor Information:
Dr. Lori Alvin
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Office Hours: MW 1:00 - 2:30pm or by appointment

Prerequisites or Co-Requisites: MAS 3105 Linear Algebra
Required Text: Matrix Analysis by Horn and Johnson
Recommended Texts: Any basic linear algebra book may be helpful.

Special Technology Utilized by Students: This course will use e-learning and the ELLUMINATE software. Students are responsible for all material posted on e-learning, including announcements, assignments, and any other coursework. Calculators are permitted in class on all homework and tests, unless otherwise stated, but full work must be shown and answers must be justified. See below for more information on ELLUMINATE.

Course Description: Topics covered will include: Eigenvalues and eigenvectors, diagonalizability; Hermitian matrices, unitary matrices, normal matrices and their spectral properties; Orthogonality and the Gram-Schmidt process; Schur’s triangularization theorem; Characteristic polynomial and minimal polynomial, Cayley-Hamilton theorem, Jordan Canonical form; Positive definite matrices, singular value decomposition; Inclusion regions for eigenvalues and Gershgorin’s theorem.

This course will cover both the theory behind matrices as well as the computational aspects of matrices. There will be definitions, theorems, proofs, and problems involving both hand computation and computer computation. It is expected students will have a solid understanding of each of these aspects of the course at the conclusion of the semester.

Student Learning Outcomes: At the conclusion of the course, students will be able to

- Compute eigenvalues and eigenvectors of matrices and explain their applications.
- Explain geometrical concepts related to orthogonality and least squares solutions and perform calculations related to orthogonality.
• Describe and derive spectral properties of the following classes of matrices: Hermitian, unitary, normal, and positive definite.

• Describe and perform algorithms that are important in matrix computations including: QR-factorization, Schur’s triangularization, Gram-Schmidt methods, singular value decomposition.

• Describe the Jordan canonical forms of matrices under similarity and perform computations associated with Jordan form.

• Describe Gershgorin’s theorem and its use in locating eigenvalues.

Topics Covered:

• Eigenvalues and eigenvectors of matrices; similarity; diagonalization (Chapter 1)

• Unitary equivalence and normal matrices, Schur’s triangularization theorem; normal matrices; QR-factorization (Chapter 2)

• Canonical forms; Jordan canonical form; polynomials of matrices and the minimal polynomial (Chapter 3)

• Hermitian and symmetric matrices and their spectral properties (Chapter 4)

• Inclusion regions for eigenvalues; singular value decomposition (Chapter 6)

• Positive definite matrices; singular value decomposition (Chapter 7)

• If time, additional topics from Chapters 5 and 8 will be covered.

Grading/Evaluation: There will be two un-proctored tests each worth 20% of your overall grade and one proctored (in-class) final exam worth 35% of the overall grade. Attendance/Participation/Assignments will be worth 25% of your overall grade.

All homework will be due on Thursdays at 5pm. No exceptions. Homework assignments should be turned in electronically in the dropbox on e-learning (I will not accept any electronic format other than PDF, and the writing must be dark enough to read); I will also accept homework turned in to me in person.

Final Grades:
A: 90 - 100% \hspace{1cm} Plus and Minus grades will be assigned
B: 80 - 89.9% \hspace{1cm} at the instructor’s discretion; i.e., 90%
C: 70 - 79.9% \hspace{1cm} does not guarantee an A, but you will
D: 60 - 69.9% \hspace{1cm} not receive lower than an A-
F: 0 - 59.9%

Policy on Late/Missing Work: As the final examination date is set in advance, you should not miss it; no make-ups will be given for missed tests. Homework assignments and take home tests will NOT be accepted after the due date/time.
Tentative Schedule:
The take-home test dates are tentatively scheduled for **July 2 and July 25**. The test will be posted in the morning and will be due in the evening at a specified time in the dropbox; the test is designed to take one class period, and class will not meet on those days to allow you enough time to complete the test. The final proctored exam period for this course is **August 8**.

Class Expectations:
I strongly recommend you do not miss class. Mathematics is a subject that requires explanation, discussion, and working problems for a mastery of the material; this cannot be achieved through reading the textbook alone. Missing class means missing out on important opportunities for interacting within the classroom. You are responsible for all material covered during each class session. **Frequent absences will not be tolerated; in order to qualify for a C in the course, you must attend at least 80% of the classes (either in person or online).** If you are unable to attend a class live, please talk with me in advance.

Please adhere to the following class policies:
1. Please do not walk into class or walk out of class while class is in session.
2. Please do not speak while I am speaking.
3. Please no eating while class is in progress.
4. Please pay attention during class: no sleeping, reading books or other materials for other classes, or using mobile devices.
5. Please silence (or use Airplane Mode) cell phones at the start of class—setting on vibrate does not count.
6. Absolutely no texting during class!

ELLUMINATE:
For students enrolled from remote locations this course has an online section that uses ELLUMINATE as the platform for instruction. The medium provides real-time instruction/communication, full two-way audio, and live display of writing on the “white board.” Students who enroll for the online section should contact the Mathematics and Statistics Department (474-2276) for a demonstration of ELLUMINATE so that they will be properly set up BEFORE classes commence.

Even though the section is described as “online”, students enrolled in this section must attend the class by logging on from the remote location **at the same time as the class in session**. This will allow students to actively participate in the class proceedings (i.e., ask and answer questions, give feedback, etc.)

There will be one proctored final exam. Students in the on-site section (face-to-face section) will do the exams in class. **Online students must arrange (with instructor’s approval) a suitable site to take the test at the same time in a proctored setting.** There is a form that must be filed. You will use option 4 on this site. For instructions see: [http://onlinecampus.uwf.edu/class/proc_exams.cfm](http://onlinecampus.uwf.edu/class/proc_exams.cfm).
Withdrawal Deadlines:
Withdrawal deadline for all courses for the term with a partial refund and grade of WR: **July 7**
Withdrawal deadline for individual or all courses for the term with automatic W: **July 20**
Withdrawal deadline for all courses for the term and grade of W or WF (instructor discretion): **Aug 10**

Students requesting a late withdrawal from class must have the approval of the advisor, instructor, and department chairperson (in that order), and finally by the Academic Appeals committee. Requests for late withdraws may be approved only for the following reasons (which must be documented):

1. A death in the immediate family.
2. Serious illness of the student or an immediate family member.
3. A situation deemed similar to categories 1 and 2 by all in the approval process.
4. Withdrawal due to Military Service (Florida Statute 1004.07).
5. National Guard Troops Ordered into Active Service (Florida Statute 250.482).

Requests without documentation will not be accepted. Requests for a late withdrawal simply for not succeeding in a course does not meet the criteria above and will not be approved.

Expectations for Academic Conduct/Plagiarism Policy:
As members of the University of West Florida, we commit ourselves to honesty. As we strive for excellence in performance, integrity-personal and institutional-is our most precious asset. Honesty in our academic work is vital, and we will not knowingly act in ways which erode that integrity. Accordingly, we pledge not to cheat, nor to tolerate cheating, nor to plagiarize the work of others. We pledge to share community resources in ways that are responsible and that comply with established policies of fairness. Cooperation and competition are means to high achievement and are encouraged. Indeed, cooperation is expected unless our directive is to individual performance. We will compete constructively and professionally for the purpose of stimulating high performance standards. Finally, we accept adherence to this set of expectations for academic conduct as a condition of membership in the UWF academic community.

Honesty Statement:
On every take-home test, you will be required to sign an honesty statement verifying that you have not received any assistance or information about the test from any other person (whether they be enrolled in the course or not). It will also state that you have used only pre-approved materials on the test. If you are ever unable to sign this clause, you must speak with me immediately.

Assistance:
The Student Disability Resource Center (SDRC) at the University of West Florida supports an inclusive learning environment for all students. If there are aspects of the instruction or design of this course that hinder your full participation, such as time-limited exams, inaccessible web content, or the use of non-captioned videos and podcasts, please notify the instructor and the SDRC as soon as possible. You may contact the SDRC office by e-mail at
sdrc@uwf.edu or by phone at (850) 474-2387. Appropriate academic accommodations will be determined based on the documented needs of the individual.

**Weather Emergency Information:**
In the case of severe weather or other emergency, the campus might be closed and classes canceled. Official closures and delays are announced on the UWF website and broadcast on WUWF-FM.

- WUWF-FM (88.1MHz) is the official information source for the university. Any pertinent information regarding closings, cancellations, and the re-opening of campus will be broadcast.
- In the event that hurricane preparation procedures are initiated, the UWF Home Web Page and Argus will both provide current information regarding hurricane preparation procedures, the status of classes and the closing of the university.

Emergency plans for the University of West Florida related to inclement weather are available on the following UWF web pages:

Information on Hurricane Preparedness plans: [http://uwfemergency.org/hurricaneprep.cfm](http://uwfemergency.org/hurricaneprep.cfm)

Information on other emergency procedures: [http://uwfemergency.org](http://uwfemergency.org)

*Any changes to this syllabus will be announced in class and posted on elearning.*