

Introduction to Matrices and Linear Algebra

Math 3330-002 – Spring 2016

Time: Tue, Thur 3:30 AM — 4:50 PM

Instructor: Prof. Barbara Shipman

Phone: (817) 272-2606

Office Hours: Tue, Thur 9 —10 AM

Website: www.uta.edu/faculty/shipman at Student Center, Math 3330

Classroom: Pickard Hall 114

Office: Pickard Hall 437

E-mail: bshipman@uta.edu

Prerequisite: C or better in MATH 1426 or HONR-SC 1426. MATH 2425 is strongly encouraged.

Textbook (required): Linear Algebra with Applications, 5th edition, by Otto Bretscher.

ISBN: 978-0-321-79697-4

Learning Outcomes: On completion of this course, students should be able to

- set up and solve systems of linear equations and interpret the results,
- explain the geometry of linear transformations and elucidate their meaning by expressing them in different coordinate systems,
- set up and solve problems involving orthogonal projection and orthonormal bases,
- compute and describe geometrically the kernel, range, determinant, eigenvectors, and eigenvalues of a linear map, and
- apply these concepts of linear algebra in solving practical problems.

Course Content (with sections from the textbook): Solving systems of linear equations, matrix operations, determinants, vector spaces, linear transformation, orthogonality, Gram-Schmidt process, projections, and eigenvalues and eigenvectors. The course will focus on the meaning and geometry of the concepts and on using this understanding to set up problems and to know when and how to apply computational techniques.

Linear Equations: 1.1 – 1.3

Linear Transformations: 2.1 – 2.4

Subspaces, Bases, Dimension, Coordinate Systems: 3.1 – 3.4

Orthogonality: 5.1 – 5.3

The Determinant: 6.1 – 6.3

Eigenvalues, Eigenvectors, Diagonalization: 7.1 – 7.5

Expectations of the Student:

- **Attendance:** At The University of Texas at Arlington, taking attendance is not required. Rather, each faculty member is free to develop his or her own methods of evaluating students' academic performance, which includes establishing course-specific policies on attendance. As determined by the instructor of this section, attendance is mandatory and counts towards the course grade as described below. You are expected to attend every class, arrive on time, and remain in class for the whole period.
- **Participation:** Bring all assigned study problems well prepared to every class and to participate fully in presentations and class activities.
- **12 hours per week outside of class.** Spend at least 12 hours per week outside of class studying and working on problems for this course.
- **Course notebook.** Keep a neat, up-to-date, and organized binder with correct solutions to all problems assigned or discussed in class.
- **MavMail and Announcements:** Keep an activated MavMail account and check it regularly. You are responsible for all information that I send to your MavMail account and all announcements made in class or on the course website.
- **Asking for help when needed.** Ask for help on material that you may not be grasping fully. You may work with your classmates, come to office hours, or send me an e-mail with specific questions.

- **Personal responsibility.** You carry the ultimate responsibility for your learning. The onus is on you to attend every class, keep up daily with the assignments, put in the expected hours, keep your course notebook up-to-date, and ask for help when needed.

Study Problems and Class Participation: Study problems will be assigned daily as posted on the course website. At every class, be prepared to explain orally, and in writing, your solution to any study problem assigned so far in the course. You may also be asked to explain your reasoning to questions that arise during class discussions. You are expected to work out correct solutions to all study problems, resolve any questions that you have on them, keep your correct solutions organized in your class binder, and bring these solutions to every class. Study problems are to be prepared as follows:

- For each problem, write out the complete question directly before the solution.
- Explain why the calculations that you are doing are what is needed to solve the problem.

Scoring for Prepared Attendance and Participation: At every class, you will receive an attendance and participation score according the following scheme. Every class counts in the final grade, and no attendance/participation score is dropped.

- 2, for being present during the entire period with good participation and preparation.
- 0—1, if you are not present during the entire period, are inadequately prepared, or do not fully participate. If you arrive late, your score will be recorded as 0; if you would like consideration for raising this to 1, please inform me *after class on the same day*.
- 0, for missing class for any reason. This records that the in-class active learning experience for that day of the course was missed.

Quizzes: Zero to two short quizzes will be given each week; these will take the place of longer midterm exams and will provide you with frequent feedback on your progress. Quizzes are cumulative and may cover any study problems, material, or readings assigned or discussed up to that point. Come to every class prepared for a possible quiz; the dates of the quizzes will be unannounced. A missed quiz cannot be made up. Three lowest quiz scores will be dropped. Here are some tips on preparing for the quizzes:

- Regularly review all class notes and study problems.
- Re-work study problems and problems discussed in class without resorting to notes. Consult notes only after good effort to re-work the problems on your own.
- Set aside ample time to work out all study problems carefully before the next class.
- Form study groups with classmates and work on coursework together.
- Pinpoint the specific question if you “get stuck” on a problem. Often in seeking to identify the question, one will see how to solve it.
- Meet with the instructor to settle remaining questions that you may have.

Final Exam: There will be a comprehensive final exam on Thursday, May 12 at 2 — 4:30 PM, in the same room as the class. A missed final exam cannot be made up.

Grading: Your work will be graded on correctness, completeness, and clarity.

Prepared Attendance and Class Participation (every day counts):	15%
Quiz Average (excluding three lowest quiz scores):	45%
Final Exam:	40%

Course average	100%

Your course average determines your final grade. A: 90—100%. B: 80—89%. C: 70—79%.

D: 60—69%. F: 0—59%. Students are expected to keep track of their performance throughout the semester and seek guidance from available sources (including the instructor) if their performance drops below satisfactory levels.

Course Schedule: *This day-by-day outline is approximate; the instructor may adjust this schedule in any way that better serves the educational needs of the students enrolled in this course.*

Week 1	Jan 19 Jan 21	Introduction to linear systems and matrices Solving linear systems via Gauss-Jordan elimination
Week 2	Jan 26 Jan 28	Setting up systems of linear equations in applied problems, solving them, and interpreting the solutions
Week 3	Feb 2 Feb 4	Introduction to geometry of linear transformations More on linear transformations and their geometry
Week 4	Feb 9 Feb 11	Matrix products and composition of linear transformations, inverse matrices and transformations
Week 5	Feb 16 Feb 18	The image and kernel of a linear transformations, with applications and examples
Week 6	Feb 23 Feb 25	Linear independence, spanning sets, basis, subspaces, dimension with examples and applications
Week 7	Mar 1 Mar 3	Expressing vectors and linear transformations in different coordinate systems; changes of basis
Week 8	Mar 8 Mar 10	Orthonormal bases, orthogonal projections The Gram-Schmidt process to find an orthonormal basis
Week 9	Mar 22 Mar 24	Orthogonal transformations and orthogonal matrices On the geometric meaning of determinants
Week 10	Mar 29 Mar 31	Properties of determinants and various techniques for computing determinants
Week 11	Apr 5 Apr 7	More on the geometry and applications of the determinant
Week 12	Apr 12 Apr 14	The concept of eigenvectors, eigenvalues and techniques for computing them
Week 13	Apr 19 Apr 21	The concept of diagonalization, via eigenvectors and eigenvalues, and consideration of non-diagonalizable transformations
Week 14	Apr 26 Apr 28	Applications to solving dynamical systems, including oscillations and complex eigenvalues
Week 15	May 3 May 5	More on applications of linear algebra to setting up and solving oscillating linear systems
Final	May 12	Final Exam 2 – 4:30 PM (Thursday)

Policies of the University of Texas at Arlington:

Drop Policy: Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. **Students will not be automatically dropped for non-attendance.** Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (<http://www.uta.edu/aao/fao/>). The last day to drop a class is Friday, April 1, by 4 PM (<https://www.uta.edu/uta/acadcal.php>).

Disability Accommodations: UT Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including *The Americans with Disabilities Act (ADA)*, *The Americans with Disabilities Amendments Act (ADAAA)*, and *Section 504 of the Rehabilitation Act*. All instructors at UT Arlington are required by law to provide “reasonable accommodations” to students with disabilities, so as not to discriminate on the basis of disability. Students are responsible for providing the instructor with official notification in the form of a letter certified by the **Office for Students with Disabilities (OSD)**. Students experiencing a range of conditions (Physical, Learning, Chronic Health, Mental Health, and Sensory) that may cause diminished academic performance or other barriers to learning may seek services and/or accommodations by contacting:

The Office for Students with Disabilities, (OSD) www.uta.edu/disability or calling 817-272-3364.
Counseling and Psychological Services, (CAPS) www.uta.edu/caps/ or calling 817-272-3671.

Only those students who have officially documented a need for an accommodation will have their request honored. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at www.uta.edu/disability or by calling the Office for Students with Disabilities at (817) 272-3364.

Title IX: The University of Texas at Arlington does not discriminate on the basis of race, color, national origin, religion, age, gender, sexual orientation, disabilities, genetic information, and/or veteran status in its educational programs or activities it operates. For more information, visit uta.edu/eos. For information regarding Title IX, visit www.uta.edu/titleIX.

Academic Integrity: Students enrolled all UT Arlington courses are expected to adhere to the UT Arlington Honor Code:

I pledge, on my honor, to uphold UT Arlington’s tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence.

I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.

UT Arlington faculty members may employ the Honor Code as they see fit in their courses, including (but not limited to) having students acknowledge the honor code as part of an examination or requiring students to incorporate the honor code into any work submitted. Per UT System *Regents’ Rule* 50101, §2.2, suspected violations of university’s standards for academic integrity (including the Honor Code) will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student’s suspension or expulsion from the University. The student will receive a score of 0 toward the course grade on any assignment, quiz, or exam that violates the Academic Integrity Policy.

Electronic Communication: UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at <http://www.uta.edu/oit/cs/email/mavmail.php>.

Student Feedback Survey: At the end of each term, students enrolled in classes categorized as “lecture,” “seminar,” or “laboratory” shall be directed to complete an online Student Feedback Survey (SFS). Instructions on how to access the SFS for this course will be sent directly to each student through MavMail approximately 10 days before the end of the term. Each student’s feedback enters the SFS database anonymously and is aggregated with that of other students enrolled in the course. UT Arlington’s effort to solicit, gather, tabulate, and publish student feedback is required by state law; students are strongly urged to participate. For more information, visit <http://www.uta.edu/sfs>.

Final Review Week: A period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research

problems or exercises of similar scope that have a completion date during or following this week *unless specified in the class syllabus*. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.

Emergency Exit Procedures: Should we experience an emergency event that requires us to vacate the building, students should exit the room and then exit the building through the doors to the left. When exiting the building during an emergency, one should never take an elevator but should use the stairwells. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist individuals with disabilities.

Student Support Services: UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include tutoring, major-based learning centers, developmental education, advising and mentoring, personal counseling, and federally funded programs. For individualized referrals, students may visit the reception desk at University College (Ransom Hall), call the Maverick Resource Hotline at 817-272-6107, send a message to resources@uta.edu, or view the information at <http://www.uta.edu/universitycollege/resources/index.php>

Student Disruption: The University may impose disciplinary action for an infraction of University policies, including engagement in conduct, alone or with others, that obstructs, disrupts, or interferes with any function of class activities.

<p>Emergency Phone Numbers: In case of an on-campus emergency, call the UT Arlington Police Department at 817-272-3003 (non-campus phone), 2-3003 (campus phone). You may also dial 911.</p>
