Mathematics 2360, Section 2 (Fall 2017): Linear Algebra

Instructor: Dmitri Pavlov, Assistant Professor
Lectures: MWF 2–2:50 p.m., MA 110
In-class midterms: Friday, September 29 and Wednesday, November 1, MA 110
Comprehensive final exam: Tuesday, December 12, 4:30 p.m. to 7:00 p.m., MA 110
Office hours: MF 3–3:50 p.m., MA 19D, or by appointment
Mathematics Tutoring and Study Center: M–F, 9 a.m. to 4 p.m., MA 106
Website: https://dmitripavlov.org/#teaching
Email: dmitri.pavlov@ttu.edu (administrative matters only, mathematical questions must be submitted via Piazza)
Piazza: https://piazza.com/ttu/fall2017/math2360002/home
Webwork: http://webwork.math.ttu.edu/webwork2/f17dpavlovm2360s002/
Prerequisite: C or better in Math 2450 (Calculus III) or consent of the department
Required textbook: Ron Larson, Elementary Linear Algebra,
    8th edition (1305658000),
    7th edition (1133110878, 1133111343),
    6th edition (0618783768, in coauthorship with Edwards and Falvo).
    Older editions also work, but 7th and 6th can already be bought very cheaply on bookfinder.com.

1 Course description

Linear algebra studies points, lines, planes, three-dimensional spaces, and their higher-dimensional analogs. It also studies *linear maps* between such objects, e.g., a line embedded into a plane or a three-dimensional space, or a hyperplane in a three-dimensional space. As a particular case of linear maps, linear algebra studies motions and deformations of the above objects, e.g., rotations, mirror reflections, or stretchings of planes, three-dimensional spaces, and their higher-dimensional analogs. Thus from a geometric point of view linear algebra is a higher-dimensional analog of analytic geometry.

The primary tools of linear algebra are algebraic operations (hence the word "algebra" in the name) such as *addition* of vectors, multiplication of a vector by a *scalar*, *multiplication* of matrices, *inverse* of matrix, etc.

The following topics will be covered:
- Basic definitions of linear algebra: vector spaces, linear maps.
- Systems of linear equations, Gaussian elimination, applications.
- Linear maps, matrices, matrix algebra, inverses, kernels, images.
- Eigenvalues and eigenvectors, diagonalization, orthogonal diagonalization.

2 Student learning outcomes

Upon the completion of this course students will be able to
- perform basic vector algebra, compute bases of vector spaces, compute coordinates of a vector;
- perform basic matrix algebra, compute matrices of linear maps, solve systems of linear equations;
- compute determinants and inverses of matrices;
- compute orthonormal bases using the Gram–Schmidt process;
- perform orthogonal diagonalization of symmetric matrices;
- compute eigenvalues and eigenvectors.

3   Prerequisites

- Mathematics 2450 (Calculus III with Applications): Partial differentiation, functions of several variables, multiple integrals, line integrals, surface integrals, Stokes theorem.
- Mathematics 1452 (Calculus II with Applications): Methods of integration, parametric equations, polar coordinates, hyperbolic functions, infinite series.
- Mathematics 1451 (Calculus I with Applications): Differentiation of algebraic and transcendental functions, differentials, indefinite integrals, definite integrals.
- Mathematics 1350 (Analytical Geometry): Fundamental concepts of analytical geometry.
- Mathematics 1321 (Trigonometry): Trigonometric functions, radians, logarithms, solutions of triangles, identities, trigonometric equations, complex numbers, de Moivre's theorem.
- Mathematics 1320 (College Algebra): Inequalities, determinants, theory of equations, binomial theorem, progressions, mathematical induction.

4   Assessment of learning outcomes

Students are required to read each section of the textbook in advance of the lecture. Assessment is conducted by virtue of *section reports*, to be submitted by the students via Piazza on noon of the same day when that section is covered in class. A typical section report for a section of the textbook consists of several questions that describe the points of confusion encountered by the student while reading the section. Alternatively, the section report requirement can also be satisfied by virtue of answering other students' questions on Piazza. Students who submit at least 2/3 of all section reports are guaranteed a passing grade for section reports.

Homework will be assigned at http://webwork.math.ttu.edu/webwork2/f17dpavlovm2360s002/. Usernames and passwords will be distributed via TTU email. Students are responsible for all deadlines posted on Webwork. Students who solve at least 2/3 of problems in a homework for a specific section are guaranteed a passing grade for this particular section. Students who earn passing grades for at least 2/3 of all sections are guaranteed a passing grade for homework assignments.

In addition to the point-based scheme described below, students must earn a passing grade on section reports and homework assignments. Failure to earn a passing grade on section reports or homework assignments automatically yields a final grade of F.

Students must consult the schedule of lectures in this syllabus and the schedule on Webwork and determine in advance when a particular section report and homework assignment is due. There will be no in-class announcements about deadlines.

Quizzes may be administered in class at the discretion of the instructor, but do not contribute toward the final grade.

The final grade will be computed from two midterm exams (worth 25 points each) and a comprehensive final exam (worth 50 points). Any student who obtains the number of points indicated on the left is guaranteed to receive at least the letter grade indicated on the right:

60–69 points: D
70–79 points: C
80–89 points: B
90–100 points: A

There will be no make-up exams, homework assignments, or section reports. Absences excused in accordance with TTU's operating policies (see below) will result in a pro rata rescaling of the evaluation criteria.

5   Regrading policy

If a problem on a midterm or final exam appears to be graded incorrectly, students can submit a regrading request. Regrading requests are submitted in writing either by email or in class. Regrading requests for midterms must be submitted no later than the next class after the graded exams are distributed. Regrading requests for the final exam must be submitted no later than 2 business days after the grades are announced.

6 Ink pen policy

All written assignments, quizzes, and exams must be completed using a black or blue ink pen only. Pencils are strictly forbidden.

7 Announcements

Announcements about homework and other matters will be made via TTU email. Students are expected to check their TTU email regularly for updates.

8 Discussion

This term we will be using Piazza for class discussion. The system is highly catered to getting you help fast and efficiently from classmates and myself. Rather than emailing questions to me, I encourage you to post your questions on Piazza. Find our class page at: https://piazza.com/ttu/fall2017/math2360002/home.

You can use the standard TEX notation for formulas, which you should surround by double dollar signs on each side (unlike TEX itself, which uses single dollar signs). A quick tutorial can be found at https://math.meta.stackexchange.com/questions/5020/mathjax-basic-tutorial-and-quick-reference.

9 Schedule

The following schedule may be subject to change as the semester progresses.

There will be a total of 39 lectures and two in-class midterms on the following days:

8/28: Introduction
8/30: §1.1
9/1: §1.2
9/6: §1.3, Chapter 1 review
9/8: §2.1
9/11: §2.2
9/13: §2.3
9/15: §2.4
9/18: §2.5 (and §2.6 in the 8th edition), Chapter 2 review
9/20: §3.1
9/22: §3.2
9/25: §3.3
9/27: §3.4, Chapter 3 review
9/29: First midterm
10/2: §4.1
10/4: §4.2
10/6: §4.3
10/9: §4.4
10/11: §4.5
10/13: §4.6
10/16: §4.7
10/18: §4.8, Chapter 4 review
10/20: §5.1
10/23: §5.2
10/25: §5.3
10/27: §5.4
10/30: §5.5, Chapter 5 review
11/1: Second midterm
11/3: §6.1
11/6: §6.2
11/8: §6.3
11/10: §6.4
11/13: §6.5, Chapter 6 review

11/15: §7.1
11/17: §7.2
11/20: §7.3
11/27: §7.4, Chapter 7 review
11/29, 12/1, 12/4, 12/6: Review.

10 Operating policy 34.04, §4: Class attendance

Responsibility for class attendance rests with the student. Regular and punctual attendance at all scheduled classes is expected, and the university reserves the right to deal at any time with individual cases of non-attendance.

The instructor determines the effect of absences on grades consistent with university policy for excused and unexcused absences. When absences jeopardize a student's standing in a class, it is the responsibility of the instructor to report that fact to the student's dean. Excessive absences constitute cause for dropping a student from class. The drop may be initiated by the instructor but must be formally executed by the academic dean. If the drop occurs before the 45th class day of a long semester or the 15th class day of a summer term, the Office of the Registrar will assign a grade of DG. If the drop occurs after those times, the student will receive an F. In extreme cases, the academic dean may suspend the student from the university.

Department chairpersons, directors, or others responsible for a student representing the university on officially approved trips must notify the student's instructors of the departure and return schedules. The instructor so notified must not penalize the student, although the student is responsible for material missed. Any student absent because of university business must be allowed to make up missed work within a reasonable span of time or have alternate grades substituted for work due to an excused absence. Students absent because of university business must be given the same privileges as other students; e.g., if other students are given the choice of dropping one of four tests, then students with excused absences must be given the same privilege.

In case of an illness that will require an absence from class for more than one week, the student should notify her/his academic dean. The dean's office will inform the student's instructors through the departmental office. In case of class absences because of a brief illness, the student should inform the instructor directly.

Refer to OP 34.19, Student Absence for Observance of Religious Holy Days, for information regarding an absence to observe a religious holy day.

11 Operating policy 34.19: Student absence for observance of religious holy day

1. "Religious holy day" means a holy day observed by a religion whose places of worship are exempt from property taxation under Texas Tax Code §11.20.

2. A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. A student who is absent from classes for the observance of a religious holy day shall be allowed to take an examination or complete an assignment scheduled for that day within a reasonable time after the absence.

3. A student who is excused under section 2 may not be penalized for the absence; however, the instructor may respond appropriately if the student fails to complete the assignment satisfactorily.

12 Operating policy 34.22, §2b: Reasonable accommodation for students with disabilities

Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor's office hours. Please note: instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, please contact Student Disability Services in West Hall or call 806–742–2405.

13 Operating policy 34.12, §5: Academic dishonesty definitions

Students must understand the principles of academic integrity, and abide by them in all class and/or course work at the University. Academic Misconduct violations are outlined Part I, section B.1 of the Code of Student Conduct. If there are questions of interpretation of academic integrity policies or about what might constitute an academic integrity violation, students are responsible for seeking guidance from the faculty member teaching the course in question.

Academic misconduct includes cheating, plagiarism, collusion, falsifying academic records, misrepresenting facts, violations of published professional ethics/standards, and any act or attempted act designed to give unfair academic advantage to oneself or another student. Additional information about academic misconduct is available in the Texas Tech University Handbook in Part II, section B of the Community Policies section in the Student Handbook at http://www.depts.ttu.edu/dos/handbook/.

14 Civility in the classroom

Texas Tech University endeavors to foster a classroom climate of mutual respect among students and between students and teacher. Mutual respect means that we should be tolerant of different ideas and varying opinions about topics of discussion in class, that we address each other respectfully and without interrupting while others are speaking, and that we do not engage in disruptive behavior in class. Signs of disrespect include, but are not restricted to: using cell phones (students must turn them off or leave them at home), reading a newspaper or other material that is not part of a class assignment while in class, talking with classmates during class, eating in class, and similar disruptive behaviors. Students who engage in disruptive behavior will be warned. Repeated disruptive behavior may result in the student being asked to leave the classroom.