

**Texas A&M University, Central Texas, Fall 2018**  
**Mathematics 550: Linear Algebra**  
**Instructor: Chris Thron**

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*Good communication is one of the keys to success.* Please *don't hesitate to call my cell phone* any time between 8 a.m.—9:30 p.m. Mon-Sat and after 2 p.m. on Sunday. I'm happy to answer your questions and address your concerns. Leave a message if I don't answer.

You can email me questions any day of the week, and usually I will answer within a couple of hours. Even if you don't know what to ask – just ask, “I'm stuck on problem number such-and-such, can you give me some hints?”

I am in the office Tuesday afternoon and all day Wednesday, in case you want to schedule an appointment. Thursday afternoon is also a possibility.

### **1.0 Course Overview:**

This course is a continuation of and explains in greater detail the concepts taught in the undergraduate linear algebra class. Topics will be selected from: vector spaces, linear mappings, subspaces, linear dependence and dimension, linear mappings, linear isomorphisms, decomposition of vector spaces as well as matrices, kernel and null spaces, dual vector spaces, matrices, change of basis, determinant of a linear transformation and a matrix, adjoint matrices, inner product spaces, orthogonal and orthonormal bases, normed vector spaces, linear mappings of inner product spaces, bilinear transformations and quadratic forms, matrix factorization, least squares and optimization, conditioning and stability of systems of equations, computation of eigenvectors, eigenvalues, and inverses of matrices.

Prerequisite: Undergraduate linear algebra.

### **2.0 Competency Goal Statements:**

Upon successfully completing MATH 550, students should be able to do the following:

- Demonstrate knowledge of fundamental definitions and theorems by repeating them.
- Demonstrate the ability to perform computations related to the material.
- Demonstrate the ability to prove mathematical theorems related to the material.
- Demonstrate an understanding of the theoretical and computational aspects of the course by applying them to related problems.
- Demonstrate the ability to apply the material in the course to investigate mathematical questions.

### **3.0 Required Materials**

**Online text:** The text is “Linear Algebra” by Jim Hefferon, available online from:

<http://joshua.smcvt.edu/linearalgebra/>

(Look in the section, “Here is Linear Algebra”.) Notice that the answers to exercises are also available.

Course videos are at:

<https://www.youtube.com/playlist?list=PL2uooHqQ6T7MQvZ1kP-NnB2rn-TA4rK5w>

**Google Group:** All out-of-class communication will be done via Google Group. *It is essential that you join the group immediately.* To subscribe to the Google group, send an email from your preferred email address to:

2016fall\_tamuct\_m550+subscribe@googlegroups.com

You will receive an email within a few minutes. Open it up and click the “Join” button. \*\*\* If you have trouble with this, please email thron@tamuct.edu directly, and I will add you directly.

#### 4.0 Course Requirements

- Homework (60%). There will be weekly homework assignments, to be turned in in class or on Blackboard. A selection of the problems will be graded – the others you can check for yourself, because the answers are on the web page.

*Doing the homework is the best preparation for the test.* I encourage you to use the computer (including Wolfram Alpha if you like) but *not* your calculator in doing the homework. I discourage the use of calculators because although they are used all the time in schools, in the “real world” they are practically useless (see for instance <http://www.vccaedu.org/inquiry/inquiry-spring2004/i-91-cohen.html>)

*Don't wait until the next class to ask about homework.* The homework is due at the beginning of class. If you have questions, use the internet to communicate.

- There are 2 tests of equal weight. Tests may be take-home or in-class, as determined by the instructor. I expect there will probably be something like 2 take-homes and 2 in-class, but this is not definite. Tests may or may not be cumulative, as determined by the instructor. Tests will include calculations, proofs, and concepts. Use of computers is allowed for questions involving calculation; use of calculators is not allowed. (I want to encourage you to use computers.)

#### 5.0 Grading Criteria Rubric and Conversion

Homework	60%	90- 100%= A
Test 1	20%	80- 89.99%= B
Test 2	20%	70- 79.99%= C
TOTAL	100%	60- 69.99%= D Below 60 % F

#### 6.0 Drop Policy

**Note:**

If you discover that you need to drop this class, you must go to the Records Office and ask for the necessary paperwork. Professors cannot drop students; this is always the responsibility of the student. The Records Office will give a deadline by which the form must be returned, completed and signed. Once you return the signed form to the records office and wait 24 hours, you must go into Duck Trax and confirm that you are no longer enrolled. If you are still enrolled, FOLLOW-UP with the records office immediately. You are to attend class until the procedure is complete to avoid penalty for absence. Should you miss the deadline or fail to follow the procedure, you will receive an F in the course.

*The last date to drop with no record on the transcript may be found on the academic calendar, or call the registrar's office.*

#### 7.0 Academic Honesty

Texas A&M University - Central Texas expects all students to maintain high standards of personal and scholarly conduct. Students found responsible of academic dishonesty are subject to disciplinary action. Academic dishonesty includes, but is not limited to, cheating on an examination or other academic work,

plagiarism, collusion, and the abuse of resource materials. The faculty member is responsible for initiating action for each case of academic dishonesty and report the incident to the Associate Director of Student Conduct. More information can be found at <http://www.tamuct.edu/departments/studentconduct/facultyresources.php>.

### **8.0 Disability Services**

If you have or believe you have a disability and wish to self-identify, you can do so by providing documentation to the Disability Support Coordinator. Students are encouraged to seek information about accommodations to help assure success in their courses. Please contact Vanessa Snyder at (254) 501-5836 or visit Founder's Hall 114. Additional information can be found at <http://www.tamuct.edu/departments/disabilitysupport/index.php>.

### **9.0 Grading Policies**

The schedule for turning in assignments in this class is given below. Depending on the class' progress, I extend the deadline for certain assignments for the entire class. However, *there will be no special extensions for individual students*. Period. I understand that life sometimes gets in the way of studies. Please take this into account. Plan ahead, and don't get caught scrambling for time.

In case of medical or family emergency, the following procedure will be followed. First, the student must provide documentation of the emergency. Then, the professor will arrange with the student to turn in assignments and/or tests that were missed as a result of the emergency. This arrangement will be specified *in writing* by the professor. If these assignments/ tests are completed satisfactorily by the given deadline, then a grade of 70 will be assigned for all missed work.

If the student wishes to appeal a grade, he/she must do so within *1 week* of receiving the graded paper. ***Students should save all their work*** to ensure that no clerical errors are made in grade reporting. Periodically during the semester, I will release a complete record of your grades so far in the class. If I have made a recording error, you may bring the paper to me and I will record it correctly.

### **10.0 Syllabus Updates**

This syllabus is not set in stone tablets. It represents the instructor's best attempt at anticipating the conditions of the class. During the course of the semester, the instructor may find it necessary to modify portions of this syllabus in order to better promote students' understanding of the material and skill in applying it. Updates to the syllabus will be emailed to the class via the Google Group.

### **11.0 Student Concerns**

In general, student concerns about this course should first be addressed to the instructor. If the student wants to remain confidential, concerns may be raised with the Mathematics Department chair, who will guarantee confidentiality.

### **Course Calendar Fall 2016**

The following schedule gives the chapters and problems covered. Modifications may be made during the course of the semester.

<b>Due Date (midnight)</b>	<b>Chapters</b>	<b>Problems</b>
4-Sep	One.I.1-3	(From Chapter I): 1.18abe (show steps), 1.22a, 1.27ab,1,34,1.37(write a system of 5 equations in 5 unknowns), 2.19ab, 2.20b, 2.32 (Hint: let $x$ =number of changes to red), 2.33a, 3.15de, 3.17a
14-Sep	One I.3, One.II.1-2 (review) One.III.1-2	(p. 32-33): 3.17ac, 3.20ad, 3.21ab, 3.24c, (p. 41-42) All checked problems (p. 47-49) All checked problems (p. 54-55) All checked problems (p. 62-63) All checked problems
21-Sep	Chapter 1 Topic: Analyzing Networks Two.I.1-2	(p. 73-75) 1a-c, 2a-c, 3, 4a-d (p. 87-90): 1.18abc, 1.19ab, 1.21ab, 1.22ace, 1.24, 1.28ace, 1.29, 1.30. 1.34. 1.35a. 1.37. 1.40-abcd. . (p. 97-100) 2.20bd, 2.21, 2.23c, 2.25bd, 2.26bd, 2.27bd, 2.29, 2.36, 2.44ac, 2.45, 2.47bd
28-Sep	Two.II.1, Two.III.1-2	(p109-113): 1.20bd, 1.21bd, 1.23b, 1.24ace, 1.27, 1.28a, 1.36, 1.39ad, 1.41ab, 1.43abc, (p. 117-119) 1.19ac, 1.20bc, 1.24, 1.25abc, 1.28ab, 1.29abc, 1.32ab, 1.34, 1.37
5-Oct	Two.III.2-3	(p. 124-126) All checked problems (p. 132-134) 3.17ab, 3.18b, 3.19ac, 3.20, 3.21ac, 3.23ac, 3.26, 3.29, 3.32, 3.34abc, 3.37, 3.39, 3.43
12-Oct	TEST	
19-Oct	(No HW due)	
26-Oct	Topics: Voting paradoxes, Dimensional analysis Three.I.1,2	Page 153-4: 1, 3, 4 Page 160-162: 1,2,4,5 Page 170-173: 1.13ac1.17bd, 1.18, 1.21, 1.25, 1.30abc, 1.33ac, 135abcd Page 179-180: 2.11, 2.13(give proof), 2.14,2.15(give example),2.16(give proof), 2.17, 2.24 (give proof)
2-Nov	Three.II.1-2	Page 186: 1.19 cd, 1.20ab, 1.21, 1.23, 1.25a, 1.27abc 1.29(to do this problem, first plot several points on the ellipse on one axis, then on another axis plot the images of these points), 1.30, 1.31, 1.35ac, 1.40a, 1.43a Page 200: 2.23abc, 2.25ac, 2.26, 2.29, 2.30cd, 2.36, 2.40abc
9-Nov	Three.III.1-2 Three IV 1	Page 211: 1.15, 1.16, 1.17ab, 1.19d, 1.22a, 1.23ab, 1.26, 1.27ab Page 219: 2.12, 2.13ab, 2.14abc, 2.16, 2.17 (replace “nonsingular” with “singular”), 2.18b, 2.22, 2.24, 2.25 Page 223: 1.9a, 1.10 ab, 1.12, 1.13, 1.16, 1.17

16-Nov	Three.IV.2,3,4	<p>Page 230: 2.15abcd (by hand), 2.17 abcd, 2.18, 2.19abcd, 2.21, 2.28, 2.32abcd, 2.34, 2.37, 2.38a</p> <p>Page 241: 3.26, 3.27, 3.28, 3.29 (replace “adjacency” with “incidence”), 3.30, 3.43, 3.44, 3.47ab</p> <p>Page 249: 4.17a,b,4.18(prove), 4.19(prove), 4.26, 4.28, 4.29, 4.33ab, 4.37</p>
23-Nov		Thanksgiving
30-Nov	<p>Three.V.1,2</p> <p>Five.I.1</p>	<p>Page 254: 1.7, 1.9ac, 1.13, 1.14,1.16, 1.19, 1.20a, 1.22</p> <p>Page 262: 2.11, 2.12a, 2.13, 2.16, 2.17, 2.21, 2.29abcde</p> <p>Page 388: 1.6abc, 1.10, 1.11,1.14,, 1.20, 1.21</p>
7-Dec	<p>Five.II.1-3</p> <p>&amp; TEST</p>	TBD

**C. Instructor Responsibilities:**

- ✓ Post necessary study materials online
- ✓ Respond effectively to all email requests within 48 hours (Please use [thron@tamuct.edu](mailto:thron@tamuct.edu) for individual issues or the google group address for questions about content.)
- ✓ Solicit feedback and respond effectively to student concerns about class organization, presentation, and content.
- ✓ Return all papers no more than 1 week after they are handed in
- ✓ Make all grades available to students after each test and at the end of the semester.

**D. Student Responsibilities:**

- ✓ **Complete each assignment by the specified due date.**
- ✓ Obtain assignments and other information for missed classes.
- ✓ **Sign up for the Google Group for this class.**
- ✓ Make use of all available study-aid options to resolve any questions that they might have regarding course material. These include:
  - Coming to office hours
  - Contacting the instructor outside of office hours via phone, chat, or email
  - Tutoring on campus
  - Discussion with other students. I encourage you to work together on homework.
- ✓ Give as much of an effort as it takes to pass this course. You should expect to spend **nine hours per week** on this class (including class, reading, and homework). If your background is shaky, you may have to spend even more time.
- ✓ **Save all graded work.** If there is a dispute about grades, no recorded grade will be changed unless the paper in question is produced.
- ✓ Bring any disputes about grades to the instructor’s attention no more than 1 week after the

paper in question is returned.

- ✓ If a grade is not recorded correctly on the instructor's grade book, the student must call this to the instructor's attention no more than 1 week after the records are given to the student (i.e. after the midterm or final).
- ✓ Students must maintain academic honesty in their work for this class, defined as follows:
  - Reading and Homework: Students may work together on reading and homework. In fact, I strongly encourage you to work together. I never would have completed graduate school if I'd done all the homework by myself. However, working together is not the same as copying. You may discuss and work out ideas together, but you must write up your solution for yourself.
  - Online or take-home tests – these are expected to be your own work. Discussion or collaboration with anyone except the instructor is not allowed. You may not look at anyone else's work on the test, and you may not discuss your work with anyone else except the instructor.  
For take-home tests, in general you are allowed to consult references (class notes, books, Internet) unless the instructions explicitly forbid this. If you do consult any references, you are required to cite your source.
  - In-class tests follow the usual conventions. In general, cheat sheets are allowed, as will be made clear by the instructor before the test.
- ✓ **Last, but not least:** by taking this class, the student signifies his/her agreement to abide by all the conditions of this syllabus.