

## Course Syllabus – Linear Algebra

Mathematics 2270, Section 02 Summer 2019

**Instructor:** Erjuan Fu  
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**Class Time and Place:** MoTuWeTh, 11:00 AM - 12:00 PM, LCB 222

**Office Hours:** Monday, 12:10-14:10pm or by appointment

**Text:** *Linear Algebra and Its Applications*, by David C. Lay, Steven R. Lay, and Judi J. McDonald 5th edition. ISBN: 13-9780321982384.

For informations about the textbook (also for future classes) this is an interesting page:

<http://www.math.utah.edu/schedule/bookInfo/>.

**Course Information:** Math 2270 Linear Algebra is a 4 credit course.

**Prerequisites:** First year calculus, Math 1210-1220 or 1250-1260 or 1270-1280. If you are unsure about meeting the prerequisites for the class you can double check with our undergraduate advisor by emailing advisor@math.utah.edu.

**Course description:** We start by thinking of vectors and matrices as arrays of numbers, then we progress to thinking of vectors as elements of a vector space and matrices as linear transformations. In our study of vectors and matrices, we learn to solve systems of linear equations, familiarize ourselves with matrix algebra, and explore the theory of vector spaces. Key topics covered in this course include Euclidean space, linear systems, Gaussian elimination, determinants, inverses, vector spaces, linear transformations, quadratic forms, least squares and linear programming, eigenvalues and eigenvectors, and diagonalization.

**Expected Learning Outcomes:** Upon successful completion of this course, a student should be able to:

1. Understand the mathematical notation and geometric interpretation involved in the study of linear systems, and make connections between the two:
  - (a) Students will understand the connection between  $Ax$  and a linear combination of vectors;
  - (b) Students conceptualize matrices as linear transformations and as encoding bilinear forms (inner products);
  - (c) Students should understand the properties of vector spaces, in particular  $\mathbb{R}^n$  as a vector space. The students extend this notion as they learn vector spaces isomorphic to  $\mathbb{R}^n$  have the same algebraic properties as  $\mathbb{R}^n$ ;
2. Perform matrix computations and understand them as examples of abstract mathematical concepts:
  - (a) Students will perform row reductions and put matrices into echelon forms. Students will connect this to several theorems regarding span, linear independence, determinant, invertibility, and rank;
  - (b) Student calculate matrix-vector and matrix-matrix products and think about these processes in the context of linear transformations;
  - (c) Students find determinants, eigenvectors, and eigenvalues and link these concepts to existence and uniqueness of solutions. Students use eigenvalues and eigenvectors find a basis in which the properties of the linear transformation become transparent;

(d) Students compute dimension and bases of vector spaces and develop these ideas in the context of linear transformations and change of coordinate systems.

3. Recognize applications and interpretations of linear algebra concepts:

- (a) Students will develop approximations using orthogonal projection and Gram-Schmidt orthogonalization;
- (b) Students will link various linear algebra concepts to applications in computing.

**Grading:** The grades will be calculated as follows:

Quizzes	25%
Midterm exams	45%
Final Exam	30%

Note: There will be three midterms. Each one will count for 15% of your final grade.

**Homework:** Weekly sets of recommended problems to prepare you for the weekly quizzes and tests. Homework will **not** be submitted.

**Quizzes:** There will be quizzes on each Tuesday when there is no test (and except the first week) and covering the material seen during the previous lectures. Quiz problems will also be based on the recommended homework problems posted the previous week. **No make-up quizzes will be given**, you will get a score of zero for the quizzes that you miss, but I will drop the two lowest quizzes.

**Midterm exams:** You will have three midterm exams, which will take place in the usual classroom and will take the entirety of one class period, and will focus on material presented in class since the last midterm (or since the beginning of the semester). The exam dates are the following:

- First midterm exam      Feb. 1, 2019
- Second midterm exam    Mar. 1, 2019
- Third midterm exam      Apr. 5, 2019

**Final exam:** The **final exam** will be comprehensive and will occur during the regularly scheduled final exam time, given by the University.

**Thursday, August 1st, 2019**  
**10:00 am – 12:00 pm**  
**LCB 222**

**Online Grades:** I will put your grades online on Canvas. I do my best to update the grades on a regular basis and keep everything accurate. However, I would advise you to check your grades often to make sure there were no data entry mistakes. I'm always happy to correct any mistakes I've made. You just need to let me know about them.

**Grading scale:** The grade scale will be the usual: A (93-100), A- (90-92), B+ (87-89), B (83-86), B- (80-82), C+ (77-79), C (73-76), C- (70-72), D+ (67-69), D (63-66), D- (60-62), E (0-59).

**Calculators:** Calculators will not be allowed on exams. They may be used on homework, but you should still write out the details of your computation. It is in your best interest not to become too dependent on your calculator since they will not be allowed on exams.

**Webpage:** All information concerning this class will be posted on the Canvas webpage of the class. Any important information will be given in class and on the Canvas webpage. **You are responsible for checking the webpage on a regular basis** (you can have the communication from Canvas forwarded to your email address).

**Additional resources:**

- **Tutoring Center & Computer Lab** There is free tutoring in the T. Benny Rushing Mathematics Student Center (room 155, the lower level between JWB and LCB), as well as a computer lab. For more information see <http://www.math.utah.edu/ugrad/tutoring.html>
- **Private Tutoring** University Tutoring Services, 330 SSB. There is also a list of tutors at the math department office JWB 233.
- **Lecture Videos** There are some lecture videos which can be found at <https://ocw.mit.edu/courses/mathematics/18-06-linear-algebra-spring-2010/video-lectures/>

**Student Responsibilities:** All students are expected to maintain professional behavior in the classroom setting, according to the Student Code, spelled out in the Student Handbook. Students have specific rights in the classroom as detailed in Article III of the Code. The Code also specifies proscribed conduct (Article XI) that involves cheating on tests, plagiarism, and/or collusion, as well as fraud, theft, etc. Students should read the Code carefully and know they are responsible for the content. According to Faculty Rules and Regulations, it is the faculty responsibility to enforce responsible classroom behaviors, and I will do so, beginning with verbal warnings and progressing to dismissal from and class and a failing grade. Students have the right to appeal such action to the Student Behavior Committee. <http://regulations.utah.edu/academics/6-400.php>

**ADA Statement:** The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability and Access (CDA), 162 Olpin Union Building, 581- 5020 (V/TDD). CDA will work with you and me to make arrangements for accommodations. All information in this course can be made available in alternative format with prior notification to CDA.

**Addressing Sexual Misconduct:** Title IX makes it clear that violence and harassment based on sex and gender (which Includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veterans status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585-2677(COPS).

**Student Names and Personal Pronouns:** Class rosters are provided to the instructor with the students legal name as well as Preferred first name (if previously entered by you in the Student Profile section of your CIS account). While CIS refers to this as merely a preference, I will honor you by referring to you with the name and pronoun that feels best for you in class, on papers, exams, group projects, etc. Please advise me of any name or pronoun changes (and update CIS) so I can help create a learning environment in which you, your name, and your pronoun will be respected. If you need assistance getting your preferred name on your UIDcard, please visit the LGBT Resource Center Room 409 in the Olpin Union Building, or email [bpeacock@sa.utah.edu](mailto:bpeacock@sa.utah.edu) to schedule a time to drop by. The LGBT Resource Center hours are M-F 8am-5pm, and 8am-6pm on Tuesdays.

**Wellness Statement:** Personal concerns such as stress, anxiety, relationship difficulties, depression, cross-cultural differences, etc., can interfere with a student's ability to succeed and thrive at the University of Utah. For helpful resources contact the Center for Student Wellness at [www.wellness.utah.edu](http://www.wellness.utah.edu) or 801-581-7776.

**Additional policies:**

- I do NOT allow the use of laptop computers or cell phones in my classroom, in order to minimize student distractions. At this point, it's almost impossible to take notes for a math class on a laptop in real time. Thus, it is unnecessary in class. If you are using a tablet or iPad or some similar device to take notes and the screen lies parallel to your desk, that is totally fine.
- There will be no retakes of exams, for any reason.
- You may take an alternate exam if you talk to me about it first and explain the emergent, extenuating circumstances that make it necessary. It is 100% your responsibility to communicate with me as soon as is possible, **before** the exam occurs (or as soon as possible). Talking to me after the problem will be sufficient reason for me to allow you to get a zero on that test. I reserve the right to make alternate exams more difficult than the scheduled exam.
- I will kindly demand respectful behavior in my classroom. Examples of disrespect include, but are not limited to, reading a newspaper or magazine in class, social chatting with your friend in class, use of your cell phone or cuddling with your girl/boyfriend in class. If you choose to be disrespectful with distracting behavior during our class, please keep in mind that you put me in a position of choosing between protecting/taking a stand for you OR for the other students or myself whom you are disrupting. I can guarantee I will choose to stand for the students who are there to learn without disruptions and I will thus take action to terminate your distracting behavior, and that action may not be desirable for you.
- If you have questions about any exam/quiz grade, or you want to appeal the grading of the exam/quiz, you must bring it to me within one week of the exam/quiz. I'm happy to look over your appeal and/or questions and give my feedback in order to benefit your learning. But, it must be done in this timeframe of a week from when I hand back the exam/quiz.

**Cheating:** A first incidence of cheating will result in a score of 0 for the work. A second incidence of cheating may result in a score of 0 for the class. Particularly severe first incidences may count as second incidences and result in a grade of 0 for the class. I will report all such incidences to the appropriate authorities.

**Disclaimer:** This syllabus may change during the semester. If I do any modification to this syllabus, I will let you know in class and post the new syllabus on the Canvas webpage.

**Course Roadmap Week-by-Week:** Below is an outline and rough schedule of the sections and topic covered in this course.

**Week 1** Introduction, Chapters 1.1, 1.2, 1.3, 1.4.

**Week 2** Chapters 1.5, 1.7. **Note, Wednesday May 22nd is the last day to drop.**

**Week 3** Chapters 1.8, 1.9, 2.1.

**Week 4** Chapters 2.2, 2.3, 3.1, 3.2. **Note, Midterm 1 on Tuesday, May 28th..**

**Week 5** Chapters 3.3, 4.1, 4.2.

**Week 6** Chapter 4.3, 4.4, 4.5. **Note, Friday June 21st is the last day to withdraw.**

**Week 7** Chapters 4.6, 4.7, 4.9. **Note, Midterm 2 on Tuesday, June 25th..**

**Week 8** Chapters 5.1, 5.2.

**Week 9** Chapters 5.3, 5.4, 5.6.

**Week 10** Chapters 6.1, 6.2, 6.3. **Note, Midterm 3 on Tuesday, July 16th..**

**Week 11** Chapters 6.4, 6.5, 7.1.

**Week 12** Chapters 7.3, 7.4. **Note, Final Exam on Thursday, August 1st, 10:00 am – 12:00 pm.**