

MATH 4326/5322: Linear Algebra (ONLINE)

CRN: 21135/25828

Spring 2021

3 credit hours

Instructor: Dr. Art Duval

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Phone:

(915)747-6846/office: I'm not there this semester, but you can leave a message any time of day or night, and it will be sent to me by email.

(915)747-6502/fax: Probably not effective while we are all working remotely.

(915)545-1788/home: 9am-9pm only, please; the line has a lot of static now, but we are trying to fix it.

Office hours: at <http://tinyurl.com/ArtDuvalSpring21>

Please visit me at the above link any time during scheduled office hours:

- Mondays, 1:00-2:00
- Tuesdays, 10:00-11:00
- Thursdays, 1:00-2:00
- Fridays, 10:00-11:00

I am also available at other times, so you are welcome to ask to meet with me at a time that is more convenient to you. You can make an appointment simply by calling me, or by sending e-mail. You can just propose a time, and I will respond either by agreeing to that time, or, if I cannot make it then, I will propose different times.

You may also ask any questions directly via phone or e-mail. If I'm not in when you call, please leave a message on the voice mail or answering machine with your name, number, and a good time for me to call you back. I will try to respond to your phone or e-mail message as soon as possible.

Prerequisite: Principles of Mathematics (MATH 3325)

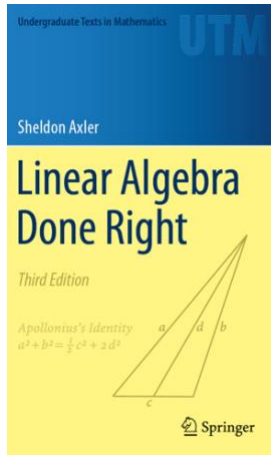
Or, an equivalent course where you learn the basics of writing proofs.

Course Objectives

Upon successful completion of the course, you will be able to prove (and occasionally discover) theorems in linear algebra, at the level of abstraction of linear transformations and vector spaces; other major topics include eigenvalues/eigenvectors and inner product spaces. You will know, understand, and be able to apply, prove, and explain major results in this area. You will be better able to independently read advanced mathematics.

Note: In contrast to Matrix Algebra (Math 3323), we will be focusing on proofs and theory instead of applications (though theory lies closer to applications in linear algebra than it does in, say, analysis), vector spaces instead of \mathbb{R}^n , and linear transformations instead of matrices. Otherwise, many topics will look familiar.

Required Materials



Textbook: *Linear Algebra Done Right, 3rd edition, by Sheldon Axler (Springer)*. We will discuss Chapters 1-7. All other material in the course will be aligned to the textbook. We will discuss approximately two sections per week. We will skip some sections as announced on Blackboard.

You will spend a substantial amount of time outside of class reading the textbook. The course will be structured to encourage and support you in this endeavor. In-class activities will center around our making use of what you have read outside of class.

Technology Requirements

Blackboard: Course content is delivered via the Internet through the Blackboard learning management system (LMS). Ensure your UTEP e-mail account is working and that you have access to the Web and a stable web browser. Mozilla Firefox and Google Chrome are the most supported browsers for Blackboard; other browsers may cause complications with the LMS. When having technical difficulties, update your browser, clear your cache, or try switching to another browser. Check for announcements on Blackboard, or via your UTEP e-mail account (where announcements will also be sent), at least once per day.

Zoom: Class meetings and office hours will be held on Zoom. The links to class meetings and office hours are in the Blackboard site, so you can access them there. More support for Zoom can be found [here](#).

Gradescope: We will be using Gradescope this term, which allows us to provide fast and accurate feedback on your work. Homework and exams will be submitted through Gradescope, and homework and exam grades will be returned through Gradescope. As soon as grades are posted, you will be notified immediately so that you can log in and see your feedback. Grades will also be posted on Blackboard.

Your Gradescope login is your university email, and your password can be changed at https://gradescope.com/reset_password. The same link can be used if you need to set your password for the first time. More support for Gradescope can be found [here](#).

Scanning: You will probably want to be able to upload your handwritten work for homework and exams. To do this, you will need to be able to scan your work, and upload it to your computer. If you don't have access to a scanner (they are sometimes built into all-in-one printers), you can use phone apps such as GeniusScan, TinyScanner, CamScanner, and AdobeScan. Please upload your work as a .pdf file. (Using your phone camera to take a picture leaves the document in a format that is harder for me to work with.)

LaTeX/Overleaf (optional): If you prefer to type your work, I strongly recommend using LaTeX. (Typing math in a normal word processing system is often clumsy.) LaTeX produces textbook-quality mathematical typesetting, yet the commands you'll need for homework are mostly very simple. If you haven't used LaTeX before, but you want to now, then the best way to learn and use LaTeX is through the free website [Overleaf](#), which has good tutorials to get you [started quickly](#), and an [extensive help page](#) if you want to do anything more advanced.

Communication: To meaningfully participate in class discussions (see below), your computer will need at least a built-in microphone. To reduce feedback, it will be helpful (but not necessary) to have headphones, and sound quality is even better if those headphones also have a microphone. Your computer will need a camera if you want to be seen during class discussions, but this is not necessary.

Technical difficulties: If you encounter technical difficulties beyond your scope of troubleshooting, please contact the [Help Desk](#) as they are trained specifically in assisting with technological needs of students.

Learning Modules

This course is designed using a modular format—that is, each week is “packaged” as a single module so that all the materials, videos, and submission areas are in one area for a given week. In a typical week, a new course Module will be posted on Blackboard. This module will have suggested sections to read from the textbook, videos, and three types of homework described below.

Weekly Meetings, Wednesdays, 1:30-2:50

We will meet synchronously via Blackboard Collaborate on Wednesdays, 1:30-2:50, to discuss questions you had from the week's readings; work on warmup exercises and share solutions; and analyze proofs. Be ready to work, to share, and to ask questions. These meetings are optional, but highly recommended.

Don't worry if you still have doubts or questions about the reading, or if you are not sure of your solution to an exercise, or if you weren't able to complete an exercise; these situations often lead to a more productive class discussion, because that lets us home in on the ideas that are most difficult. Furthermore, discussions are not in any way graded, so there is no penalty for saying something that is not correct.

Class Recordings

Wednesday class discussions will be recorded, and then posted on Blackboard later that day. The use of recordings will enable you to have access to a class discussion in the event you miss it, or even if you just want to see it again. Our use of such technology is governed by the Federal Educational Rights and Privacy

Act (FERPA) and UTEP's acceptable-use policy. A recording of class sessions will be kept and stored by UTEP, in accordance with FERPA and UTEP policies. Your instructor will not share the recordings of your class activities outside of course participants, which include your fellow students, teaching assistants, or graduate assistants, and any guest faculty or community-based learning partners with whom we may engage during a class session. You may not share recordings outside of this course. Doing so may result in disciplinary action.

Course Assignments and Grading

Homework

Advance preparation (20%) You will read the week's sections carefully and watch the corresponding video, write responses to reading questions, create some of your own questions, and reflect. This part of the homework will generally be due each week at 5:00pm on Tuesday, the day before we discuss that material in class on Wednesday. (This will give me a chance to use your responses to plan Wednesday's class.)

Warmup exercises (10%) During our weekly class meetings on Wednesdays, we will discuss easier warmup exercises. You will prepare your answers, in writing, before class, and the class will share answers in small groups or whole class discussions. (Technical details about sharing are above, in Technology Requirements.) Then turn in your final version of these problems by 11:59pm on Thursday.

Main exercises (30%) After our class discussion over the material, you will turn in clearly-written solutions to harder homework problems. These will generally be due by 11:59pm on Sunday. [Graduate students](#), who are enrolled in MATH 5322, will be assigned more main exercises than undergraduates, who are enrolled in MATH 4326, in accordance with university policy.

For homework, you may consult with various sources for general help with any problem, but you must solve the particular problem by yourself. Sources you may consult include: classmates; friends, tutors; any material from the class, including the textbook or class videos; online books and videos. **If you consult any sources outside of the class, you must let me know which sources you used** (a short message, by email or within Blackboard, will suffice). More details about homework is in the Appendix.

For each of these three types of homework, the lowest score will be dropped.

Exams

Midterm exam (15%) The midterm exam will cover all material up to that point (Chapters 1-3). It will last 90 minutes (the usual 80 minutes and an extra 10 minutes to make sure you have enough time to upload your work). You may start the exam as early as 12:00am, and as late as 11:59pm, on **Wednesday, March 10.**

Final exam (25%) The final exam will be comprehensive over all material of the course. It will last 3 hours (the usual 2 hours, 45 minutes, and an extra 15 minutes to make sure you have enough time to upload your work). You may start the exam as early as 12:00am, and as late as 11:59pm, on **Wednesday, May 12.**

For exams, you may consult only with any notes you took during class, the textbook, and class videos. No other sources are allowed. You may not consult with any person.

Grading scale

All graded items will be graded on, or converted to, a scale where 4 is the minimum score for an A, 3 is the minimum score for a B, 2 is the minimum score for a C, and 1 is the minimum score for a D.

Late work

Homework: Extensions on homework deadlines will only be given under unusual circumstances, and with an explanation. (Too much work in other classes is not a sufficient explanation.) It is generally better to submit an incomplete assignment than a late assignment. Remember, too, that the lowest homework score of the semester for each type of homework will be dropped, and this is usually the best solution for that one week in the semester when everything in your life goes wrong.

Exams: Make-up exams will only be given under extraordinary and unavoidable circumstances, and with advance notice if possible. You will need to provide written documentation. If you anticipate a conflict with any exam date, please contact me as soon as possible. Otherwise, please make space on your calendar right now for all exams.

Alternative means of submitting work in case of technical issues

I strongly suggest that you submit your work with plenty of time to spare in the event that you have a technical issue with the course website, network, and/or your computer. I also suggest you save all your work (discussion posts, homework, and exams) in a separate document as a back-up. This way, you will have evidence that you completed the work and will not lose credit. If you are experiencing difficulties submitting your work through the course website, please contact the UTEP Help Desk. You can email me your back-up document as a last resort.

Discussion Board

The Blackboard site will have a Discussion Board. This will be a great place to ask, and answer questions. If you see a classmate has posed a question that you know the answer to, please do respond. I will also be checking, but your classmates may be on the computer when I am not, so you may actually get a faster answer there.

Netiquette: Our conversations on the discussion board will be governed by the following important principles.

- Always consider audience. Remember that members of the class and the instructor will be reading any postings.
- Respect and courtesy must be provided to classmates and to instructor at all times. No harassment or inappropriate postings will be tolerated.
- When reacting to someone else's message, address the ideas, not the person. Post only what anyone would comfortably state in a face-to-face situation.
- Blackboard is not a public internet venue; all postings to it should be considered private and confidential. Whatever is posted on in these online spaces is intended for classmates and professor only. Please do not copy documents and paste them to a publicly accessible website, blog, or other space. If students wish to do so, they have the ethical obligation to first request the permission of the writer(s).

Drop Policy

To drop this class, please contact the [Registrar's Office](#) to initiate the drop process, by the deadline of Thursday, April 1. After this date, you will not be able to drop the class (as per the Dean's office). Furthermore, a grade of incomplete is only for extraordinary circumstances, such as a missed exam.

I hope everyone will complete the course successfully, but if you are having doubts about your progress, I will be happy to discuss your standing in the course to help you decide whether or not to drop. You are only allowed three enrollments in this course, and only six withdrawals in your entire academic career, so please exercise the drop option judiciously.

Exceptional Circumstances

If you anticipate the possibility of not being able to participate in the course due to exceptional circumstances such as military service and/or training, childbirth, etc., please let me know as soon as possible.

Accommodations Policy

The University is committed to providing reasonable accommodations and auxiliary services to students, staff, faculty, job applicants, applicants for admissions, and other beneficiaries of University programs, services and activities with documented disabilities in order to provide them with equal opportunities to participate in programs, services, and activities in compliance with sections 503 and 504 of the Rehabilitation Act of 1973, as amended, and the Americans with Disabilities Act (ADA) of 1990 and the Americans with Disabilities Act Amendments Act (ADAAA) of 2008. Reasonable accommodations will be made unless it is determined that doing so would cause undue hardship on the University. If you have, or suspect you have, a disability and need an accommodation, you should contact [UTEP Center for Accommodations and Support Services \(CASS\)](#) at (915)747-5148 or cass@utep.edu, or apply for accommodations online via the [CASS portal](#). You are responsible for presenting to me any CASS accommodation letters and instructions.

Scholastic Integrity

Academic dishonesty is prohibited and is considered a violation of the UTEP Handbook of Operating Procedures. It includes, but is not limited to, cheating, plagiarism, and collusion. Cheating may involve copying from or providing information to another student, possessing unauthorized materials during a test, or falsifying research data on laboratory reports. Plagiarism occurs when someone intentionally or knowingly represents the words or ideas of another as one's own. Collusion involves collaborating with another person to commit any academically dishonest act. Any act of academic dishonesty attempted by a UTEP student is unacceptable and will not be tolerated. I report all suspected violations of academic integrity to the [Office of Student Conduct and Conflict Resolution \(OSCCR\)](#) for investigation and possible disciplinary action. To learn more, see [HOOP: Student Conduct and Discipline](#).

Copyright Statement for Course Materials

All materials used in this course are protected by copyright law. The course materials are only for the use of students currently enrolled in this course and only for the purpose of this course. They may not be further disseminated.

Student Resources

UTEP provides a variety of student services and support:

- [Math Tutoring Center \(MaRCS\)](#): Ask a tutor for help and explore other available math resources.
- [UTEP Library](#): Access a wide range of resources including online, full-text access to thousands of journals and eBooks plus reference service and librarian assistance for enrolled students.
- [Help Desk](#): Students experiencing technological challenges (email, Blackboard, software, etc.) can submit a ticket to the UTEP Helpdesk for assistance. Contact the Helpdesk via phone, email, chat, website, or in person if on campus.
- [University Writing Center \(UWC\)](#): Submit papers here for assistance with writing style and formatting, ask a tutor for help and explore other writing resources.
- [Military Student Success Center](#): UTEP welcomes military-affiliated students to its degree programs, and the Military Student Success Center and its dedicated staff (many of whom are veterans and students themselves) are here to help personnel in any branch of service to reach their educational goals.
- The [Student Success Helpdesk](#) understands that juggling life and school can be difficult. They have a team dedicated to providing students with support for challenges such as: financial literacy; paying for college; and food, housing, and transportation resources.

COVID-19 Precautions

Even though our course is meeting entirely online, it benefits the entire UTEP community if we are all aware of the following precautions.

You must STAY AT HOME and REPORT if you (1) have been diagnosed with COVID-19, (2) are experiencing COVID-19 symptoms, or (3) have had recent contact with a person who has received a positive coronavirus test. Reports should be made at screening.utep.edu. If you know of anyone who should report any of these three criteria, you should encourage them to report. If the individual cannot report, you can report on their behalf by sending an email to COVIDaction@utep.edu.

For each day that you attend campus—for any reason—you must complete the questions on the UTEP screening website (screening.utep.edu) prior to arriving on campus. The website will verify if you are permitted to come to campus. Under no circumstances should anyone come to campus when feeling ill or exhibiting any of the known COVID-19 symptoms. Students are advised to minimize the number of encounters with others to avoid infection.

APPENDIX: More details about homework

In all cases, strive to write your responses clearly. Use complete sentences where appropriate, and show steps of any calculations, etc.

Advance preparation

You may work with others on this part, but you must write your responses by yourself.

Reading questions: Read assigned material. Reread as needed for complete understanding. Then write clear responses to assigned questions about the reading.

Your questions: Write down some of your own explicit questions about your reading, ready to bring up in class. This may involve new or old concepts which are confusing to you, and connections to other ideas. You may also write down what was well explained and interesting, what was confusing, what you had to reread but eventually understood. Do not leave this section blank, or just write, "This section was easy." If the section was indeed easy for you, then be sure to comment on where the textbook explanation was good or bad, or find connections to other ideas.

Reflection: Write two or three sentences reflecting on the process of your work; this should only take a few minutes. Write about how things went with any assignment or reading done for class, and other course work. This should reflect both your ongoing personal feelings about the course as a whole and your interaction with the material at hand.

Time and resources: Write how much time you worked on the Advance preparation, and with whom. Also write down any other sources you consulted.

Warmup exercises

Work individually, and **then** with others outside class time, on a few assigned easy warmup exercises on the new material we will discuss, based on your Advance preparation. Write up the solutions to these individually, to share in in class. I will ask individuals and groups to present some of these to the class, to get us started discussing new material. You may use the class discussion to improve your solutions before you turn them in.

Also always write how much time you worked on the Warmup exercises, and with whom. Also write down any other sources you consulted.

Main exercises

Work individually and with others on these problems. Also visit me during office hours or at other appointment times to ask questions. I am happy to help you. Then write up your final solutions completely by yourself, without comparing with other people. The paper you submit should be entirely your own writing, not the same as anyone else's.