Course Syllabus

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Arizona State University

MAT 343: Applied Linear Algebra

Course and Faculty Information

Course Description: Solving linear systems, matrices, determinants, vector spaces, bases, linear transformations, eigenvectors, norms, inner products, decompositions, applications. Problem solving using MATLAB.

Credits: 3

Prerequisites: The official prerequisite is MAT 266 with a grade of C or better. However, it is strongly recommended students take MAT 267 (Calculus III) prior to taking this class.

Instructor: Richard Reynolds

Contact Info: *rich@asu.edu*

Zoom Office Hours and Links (AZ time)**:**
Monday 2:40pm-3:10pm, https://asu.zoom.us/j/89700900931 (https://asu.zoom.us/j/89700900931)
Tuesday, 9:30am-10:15am, https://asu.zoom.us/j/88601594933 (https://asu.zoom.us/j/88601594933)
Wednesday 2:40pm-3:10pm, https://asu.zoom.us/j/89700900931 (https://asu.zoom.us/j/89700900931)
Thursday, 9:30am-10:15am, https://asu.zoom.us/j/88601594933 (https://asu.zoom.us/j/88601594933)
Friday 2:40pm-3:10pm, https://asu.zoom.us/j/89700900931 (https://asu.zoom.us/j/89700900931)
And by appointment.

Course Overview

Linear Algebra is the study of vector spaces and linear transformations on vector spaces. Linear Algebra is central to both pure and applied mathematics. Techniques from Linear Algebra are also used in analytic geometry, engineering, physics, natural science, computer science, and the social sciences. Topics include the use and application of matrices in the solution of systems of linear equations, determinants, real n-dimensional vector spaces, abstract vector spaces and their axioms, linear independence, span and bases for vector spaces, linear transformations, eigenvalues and eigenvectors, matrix factorizations, and orthogonality. Computer explorations using MATLAB is an integral component of this course.

Course Learning Outcomes

At the completion of this course, students will be able to:

1. Use matrices to solve linear systems of equations.
2. Verify whether a given set is a vector space.

3. Find bases of subspaces.
4. Find matrix representations of linear transformations and use them in applied problems.
5. Determine eigenvalues and bases of eigenspaces.
6. Determine and use matrix factorizations such as LU, QR and SVD.

Textbooks

Linear Algebra with Applications, 10e by Steven J. Leon, Lisette G. De Pillise, Pearson-Prentice Hall. The textbook is recommended but not required. *The 7th Edition is on reserve in the Noble Library for an up to 2-hour checkout*.

Calculators

During proctored exams, only the following online calculators are allowed: **Desmos Matrix Calculator, (https://desmos.com/matrix)** **Desmos Scientific Calculator (https://desmos.com/scientific)** , and **Desmos Graphing Calculator (https://desmos.com/graphing)** . Links to these calculators will be provided in the tests. No other online calculators are permitted, and handheld calculators are not allowed.

Course Access

Your ASU courses can be accessed by both **my.asu.edu (http://my.asu.edu)** and **myasucourses.asu.edu (http://myasucourses.asu.edu)** ; bookmark both in the event that one site is down.

Computer Requirements

This is a fully online course; therefore, it requires a computer with internet access and the following technologies:

- Web browsers (**Chrome (https://www.google.com/chrome)**)
- **Adobe Acrobat Reader (http://get.adobe.com/reader/)** (recommended)
- Webcam, microphone, and speaker
- Reliable broadband internet connection (DSL or cable) to stream videos.

Note: A smartphone, iPad, Chromebook, etc. will not be sufficient for completing your work in ASU Online courses. While you will be able to access course content with mobile devices, you must use a computer for all tests and labs.

Help

For technical support, use the Help icon in the black global navigation menu in your Canvas course or call the ASU Help Desk at +1(855) 278-5080. Representatives are available to assist you 24 hours a day, 7 days a week.

Student Success

To be successful:

- check the course daily
- read announcements
- read and respond to course email messages as needed
- complete assignments by the due dates specified
- communicate regularly with your instructor and peers
- create a study and/or assignment schedule to stay on track

- plan to allocate at least 19 hours per week of coursework (Arizona Board of Regents requires 135 total hours of coursework for a 3-credit course).
- access **ASU Online Student Resources** (http://goto.asuonline.asu.edu/success/online-resources.html)

Grading

Your grade will be determined based on the following grading schema:

Grade	Percentage	Grade	Percentage
A+	100% - 97%	B-	80% - 82.9%
A	96.9% - 93%	C+	76% - 79.9%
A-	92.9% - 90%	C	70% - 75.9%
B+	87% - 89.9%	D	60% - 69%
B	83% - 86.9%	E	Below 60%

WEEK	TOPICS	ACTIVITIES/ASSIGNMENTS
WEEK 1 **8/22-8/28**	• Systems of Linear Equations • Row Echelon Form • Matrix Arithmetic • Matrix Algebra	• SYLLABUS QUIZ (due Sun. 8/25) • **Academic Integrity Quiz** (due Sun. 8/25) (grades will be withheld if not completed) • Edfinity 1.1 and 1.2 (due Sun. 8/25) • MATLAB LAB 0 (due Mon. 8/26) • Edfinity 1.3 & 1.4 (due Wed. 8/28)
WEEK 2 **8/29-9/4**	• MATLAB LAB 1 • Elementary Matrices • The Determinant of a matrix • Properties of Determinants	• MATLAB LAB 1 (due Fr. 8/30) • Edfinity 1.5, 2.1 (due Sun. 9/1) • Edfinity 2.2 (due Mon. 9/2) • Playposit videos 1.1 to 2.2 due Tu. 9/3 • **TEST 1** (Wed. 9/4) covers 1.1-1.5, 2.1, 2.2
WEEK 3 **9/5-9/11**	• MATLAB LAB 2 • Vector Spaces • Subspaces • Linear Independence • MATLAB LAB 3	• MATLAB LAB 2 (due Fr. 9/6) • Edfinity 3.1 (due Sat. 9/7) • Edfinity 3.2 & 3.3 (due Tu. 9/10) • **EXAM 0** (opens 9/10, closes 9/15) • MATLAB LAB 3 (due Wed. 9/11)
WEEK 4 **9/12-9/18**	• Basis and Dimension • Change of Basis • Row Space and Column Space • Linear Transformations	• Edfinity 3.4 & 3.5 (due Fr. 9/13) • Edfinity 3.6 & 4.1 (due Sun. 9/15) • Edfinity 4.2 (due Tu. 9/17)

	• Matrix representations of Linear Transformations	
WEEK 5 **9/19-9/25**	• MATLAB LAB 4 • The scalar product in R^n • Orthogonal Subspaces • Least Squares Problems • Inner Product Spaces	• MATLAB LAB 4 (due Th. 9/19) • Playposit videos 3.1 to 4.2 due Fr. 9/20 • **EXAM 2** (Sat. 9/21) covers 3.1-3.6, 4.1, 4.2 • Edfinity 5.1 & 5.2 (due Tu. 9/24)
WEEK 6 **9/26-10/3**	• MATLAB LAB 5 • Orthonormal Sets • The Gram-Schmidt Orthogonalization process	• Edfinity 5.3 & 5.4 (due Th. 9/26) • MATLAB LAB 5 (due Sat. 9/28) • Edfinity 5.5 & 5.6 (due Mon. 9/30) • Playposit videos 5.1 to 5.6 due Tu. 10/1 • **TEST 3** (Wed. 10/2) covers 5.1-5.6
WEEK 7 **10/4-10/11**	• Eingenvalues and Eigenvectors • Diagonalization • The Singular Value Decomposition • MATLAB LAB 6	• Edfinity 6.1 (due Sat. 10/5) • Edfinity 6.3 & 6.5 (due Tu. 10/8) • MATLAB LAB 6 (due Wed. 10/9) • Playposit videos 6.1, 6.3, 6.5 due Th. 10/10 • **FINAL EXAM** (Fr. 10/11) Comprehensive.

Methods of Evaluation

Test 1	9%	Wednesday 9/4
Exam 0 (proctored)	2%	open 9/10-9/15
Exam 2 (proctored)	25%	Saturday 9/21
Test 3	9%	Wednesday 10/2
FINAL (proctored)	25%	Friday 10/11
Edfinity	15%	
MATLAB LABS	10%	
Playposit Videos	5%	

Edfinity

Online Homework will be submitted online via the internet using the homework system Edfinity. Edfinity contains questions pertaining to each topic, the due dates for which are listed on the website and in this syllabus. **No extension of due dates will be given but 20% extra credit will be given on work completed for early work up to 1 day before the due date.** The homework will count for 15% of the grade.

To enroll in our Edfinity section, please follow the steps below:

1. **Important**: Upgrade to the latest version of Google Chrome or Firefox on a Windows/Mac computer. Other browsers such as Safari may cause issues when you access Edfinity via Canvas.

2. Log into your Canvas course.
3. Click on the Edfinity link in the Course Navigation Menu (on the left side of Canvas) to launch into Edfinity - you will automatically be signed into Edfinity. You **should not**sign up directly on **com** (https://urldefense.com/v3/__http:/edfinity.com/__;!!IKRxdwAv5BmarQ!ZKuGnmOa5StMoe4Z-NIdwXIVaAO3A8msiWXXsLo74fgwUYiIUoLfW4HDE1kPXMUmcET0WYa6JyH_4an0$)
4. The first time you access Edfinity, you will be prompted to either pay using a debit/credit card ($35) **OR** enter an access code. If you need to purchase through the Bookstore due to financial aid or scholarship, you can use this direct link: **https://www.bkstr.com/arizonastatestore/product/edfinity-with-office-hours-610030-1** (https://urldefense.com/v3/__https:/www.bkstr.com/arizonastatestore/product/edfinity-with-office-hours-610030-1__;!!IKRxdwAv5BmarQ!d6em5FVh45rDfAIdyBySsQVawf4d6iLsvZpZofCiAXZ3YG3TUNTwpAjv4kyM07Gv6OPp7e_vjpa9ew$)
5. Please enroll directly on Edfinity. This guarantees you the best price available ($35). If (and only if) you are on financial aid, purchase Edfinity access codes through the bookstore. Remember, enrolling on Edfinity is the most cost-effective option. There is a 2-week grace period during which you may drop the course and receive a refund.

MATLAB

There will be a total of six MATLAB computer labs plus a LAB 0, which is extra credit. The first five labs will be automatically graded through MATLAB Grader (you have unlimited attempts until the due date), while lab 6 will be submitted through the Assignment feature in Canvas in pdf format. The labs count for 10% of the grade. **No late assignments will be accepted.**

The lowest lab grade will be dropped. You are **not** required to purchase MATLAB. All students can download MATLAB through MyApps or can use MATLAB remotely through MyApps. Check the Links & Tool module for more information about MATLAB.

Playposit Interactive Videos

The lecture videos in this course use the interactive video platform Playposit. Interactions are added in the videos, ranging from multiple choice questions to pauses with additional information. The multiple choice questions must be answered correctly to receive credit and students have only one attempt to do so. Watching the videos and completing the interactions will count for 5% of the total grade. Five of the Playposit videos will count as extracredit.

Students do not need to complete all the interactions at once; they can pause and resume later if needed. Fast forwarding is not allowed the first-time students watch the video. Once the interactions are completed, students can rewatch the video as many times as they want, and fast forwarding will be allowed. Note that the due dates are set for the day before the corresponding test, however, **you should watch the interactive videos before you work on the homework.**

Exams Procedures

There will be four mid-term exams and one final exam. All exams will be administered through Edfinity.
Exam 0 is the first proctored exam and counts for 2% of the grade. Exam 2 and the Final are also proctored, and they will count for 50% of the grade. These exams must be taken through HonorLock. More information about the online proctoring service HonorLock is posted in the Course Home. **Make sure you check the Proctored Exams page** in the Links & Tools module in canvas. The main purpose of Exam 0 is to familiarize yourself with the Honorlock set up and with the required camera placement. **Taking Exam 0 is a prerequisite for Exam 2 and the Final Exam.** Face, hands and working area must be in view at all times while taking the test. **If you fail to follow this policy, you will receive a grade of 0.**

All exams, except for Exam 0, will be available for a period of 24 hours during which you can access it at any time. However, once you access it, you will have two hours to complete it (provided you access the test before 9:59pm). **Books**

or notes are not allowed during proctored exams. Hand held calculators are not allowed. Exam 0 will be open for 6 days and it is timed at 30 minutes.

Test 1: Wednesday 9/4 (available from 12:00am MST to 11:59pm MST). Covers 1.1-1.5, 2.1, 2.2

Exam 0: open 9/10-9/15. Covers material from Test 1.
Exam 2 (proctored): Saturday 9/21. Covers 3.1-3.6, 4.1, 4.2
Test 3: Wednesday 10/2 (available from 12:00am MST to 11:59pm MST). Covers 5.1-5.6
Final (proctored): Friday 10/11. Comprehensive.

Honorlock records you and your environment during exams and requires that you download a temporary program onto your computer. Your face, hands and working area must be in view while taking the test. Additionally, you will be required to perform a thorough room scan with a webcam prior to starting the exam. If you do not wish to do this, then you should withdraw from the course.

The proctoring process includes verifying the identity of the students by presenting a valid identification card as part of the verification process and monitoring by online proctoring software. Do not use your ASU Sun Card if it is also a debit card; use another state issued ID instead.

To get started, you will need Google Chrome and download the **Honorlock Chrome Extension (https://static.honorlock.com/install/extension)** .

When you are ready to complete your assessment, log into Canvas, go to your course, and click on "Honorlock CLAS". Clicking "Launch Proctoring" will begin the Honorlock authentication process, where you will take a picture of yourself, show your ID, and complete a scan of your room. Honorlock will be recording your exam session through your webcam, microphone, and recording your screen. Honorlock also has an integrity algorithm that can detect search-engine use, so please do not attempt to search for answers, even if it's on a secondary device.

Honorlock support is available 24/7/365. If you encounter any issues, you may contact them through live chat on the **support page (https://honorlock.com/support/)** or within the exam itself. Some guides you should review are **Honorlock MSRs (https://honorlock.kb.help/students-starting-exam/minimum-system-requirements/)** , **Student FAQ (https://honorlock.kb.help/students-starting-exam/honorlock-student-faq/)** , **Honorlock Knowledge Base (https://honorlock.kb.help/)** , and
How to Use Honorlock (https://www.youtube.com/watch?v=wRWE-9PUquo&feature=youtu.be)

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Academic Integrity

Please be aware that the School of Mathematics and Statistical Sciences (SoMSS) takes academic dishonesty in any form as a very serious matter. We are obliged to investigate all such cases and if the evidence warrants it, we send the case up to the Dean's Office for review. Possible sanctions can be severe, from a 0 on the assessment, up to possible grade of XE for the class.

Examples of academic dishonesty during an examination include, but are not limited to, using a prohibited device or program, accessing alternate websites, receiving help from another person, or posting information about the exam to any outside forum, whether affiliated with ASU or not. Proctored exams are recorded. Covering the camera, having people with

you, talking aloud, wearing earbuds or headphones, wearing hats, having a camera angle that is too tight (i.e. too close to your face), or peculiar motions that suggest proscribed behavior are also grounds for investigation.

Please do not engage in this behavior, nor abide by those who do. The sanctions can be devastating. This kind of behavior is not worth the risk. Please keep in mind we are familiar with methods of cheating and know what to look for, so if you are struggling with your class, it is always better to discuss your concerns with your instructor rather than engage in a behavior that could result in severe sanctioning and affect your future scholarships, graduation, or grad-school chances.

- The use of ChatGPT and other generative AIs on assignments or exams is **not permitted.** In this course, all assignments must be completed by the student. Artificial Intelligence (AI), including ChatGPT and other related tools used for creating of text, images, computer code, audio, or other media, are not permitted for use in any work in this class. Use of these generative AI tools will be considered a violation of the **ASU Academic Integrity Policy (https://provost.asu.edu/academic-integrity/policy)** , and students may be sanctioned for confirmed, non-allowable use in this course.
- Any photograph or screenshot taken during an exam is grounds for a 0 score on the test and academic dishonesty charges.
- Any (parts of) exams, assignment, reports, or solutions to these, from current or previous semester, posted to any website not affiliated with ASU will result in academic integrity disciplinary actions against the students posting them and the students using them.
- No phones or any internet-capable device can be accessed for any reason during a proctored exam. Accessing any such device for any reason will result in a score of 0 for the exam. This includes smart watches. Your instructor reserves the right to ask you to remove your watch during an exam. Notes or "cheat sheets" are not allowed during proctored exams. The only window open during your exam should be the one with the test.

ASU Official Photo Requirement

According to ASU policy, **all** online students are required to have an official photo on file with the university. If you do not have an official photo on file, please click on this link to upload one: **https://webapp4.asu.edu/cardservices/. (https://webapp4.asu.edu/cardservices/)** There is no charge for uploading the picture. **Test grades will be withheld if the student does not have an official photo on file, which will result in the student failing the course. Grades will also be withheld if the Academic Integrity Agreement is not submitted.**

Submitting Assignments

Scores from Playposit videos will be automatically submitted to canvas. Edfinity scores will be automatically submitted to canvas. MATLAB assignments 1 through 5 are automatically submitted to canvas. Lab 6 must be submitted in pdf format to the designated area of Canvas.

Assignment due dates follow Arizona Standard time. Click the following link to access the **Time Converter (http://www.thetimezoneconverter.com/)** to ensure you account for the difference in Time Zones. Note: Arizona does not observe daylight savings time.

Grading Procedure

Grades reflect your performance on assignments and adherence to deadlines. Grades on assignments will be available within 48 hours of the due date in the Gradebook. Grades are based only on academic work and are calculated using the same criteria for all students. It is highly unethical to bring to your instructor's attention the possible impact of your mathematics grade on your future plans, including graduation, scholarships, jobs, etc. The instructor may exercise an option to withdraw you from the course if they think you are compromising the ability to assess your work independently of any other consideration. The Y grade is **not** an option for this class.

Late or Missed Assignments

Notify the instructor **BEFORE** an assignment is due if an urgent situation arises and you are unable to submit the assignment on time.

Follow the appropriate University policies to request an accommodation for religious practices (ACD 304-04 at **https://policy.asu.edu (https://policy.asu.edu)**) or to accommodate a missed assignment due to University-sanctioned activities (ACD 304-11 at **https://policy.asu.edu (https://policy.asu.edu)**)

Communicating With the Instructor

Ed Discussion

This course uses the discussion board Ed for general questions about the course and assignments. Students are encouraged to post questions and other students are encouraged to offer assistance. The instructor and any teaching assistants will monitor Ed Discussion regularly, offering feedback whenever necessary. Prior to posting a question, please check the syllabus, announcements and existing posts. If you do not find an answer, post your question.

Student Rules of Engagement (Ed Discussion):

- All questions related to classwork should be posted to Ed Discussion. Any homework or classwork questions emailed directly to the instructor will not be answered. Email should be used only for private communications with the instructor.
- Please include a couple lines of your work. You may also photograph your written work and insert the image within the post. Please trim the image size if possible.
- Please be courteous at all times. No vulgar, demeaning, or aggressive language will be tolerated.
- Do not use Ed Discussion to air grievances or to campaign.
- Do not use Ed Discussion for personal messages. In such a case, email the instructor directly.
- Stay on topic. Do not use Ed Discussion for discussions not related to this class.
- Keep a civil and friendly atmosphere. Ed Discussion works best when we have a lot of students willing to engage the forum.
- Please do not expect immediate replies. Instructors usually check the forum daily. In the meantime, other students are encouraged to add feedback and commentary. Instructors may also deliberately stay in the background so as to promote student-led discussions.
- Do not use Ed Discussion to link to or promote third-party forum sites not affiliated with ASU.

Failure to adhere to these requirements may result in your posting privileges being revoked.

Email

ASU email is an **official means of communication** (SSM 107-03 at **https://policy.asu.edu (https://policy.asu.edu/)**) among students, faculty, and staff. Students are expected to read and act upon email in a timely fashion. Students bear the responsibility of missed messages and should check their ASU-assigned email regularly. Please **do not** use the Canvas inbox for messages.

All instructor correspondence will be sent to your ASU email account. **Do not auto-forward your ASU email to a personal account.** Due to security measures of major email providers including Google, Yahoo and Apple, emails sent to and from your ASU email account may be delayed or lost due to auto-forwarding.

ASU Online Course Policies

ASU expects all students in online courses to observe "netiquette" or tactful, courteous behavior. An instructor may withdraw a student from the course when his or her behavior is deemed inappropriate. View the **ASU Online Course Policies (https://asuonline-dev.asu.edu/qm-template/CanvasQM/qm-policies.html)**

Copyrighted Materials

Students must refrain from uploading to any course shell, discussion board, or website used by the course instructor or other course forum, material that is not the student's original work, unless the students first comply with all applicable copyright laws; faculty members reserve the right to delete materials on the grounds of suspected copyright infringement. **The content of this course, including lectures and other instructional materials, are copyrighted materials. Students may not share outside the class, including uploading, selling or distributing course content or notes taken during the conduct of the course.** Any recording of class sessions is authorized only for the use of students enrolled in this course during their enrollment in this course. Records and excerpts of recordings may not be distributed to others. Any (parts of) exams, assignment, reports, or solutions to these, from current or previous semester, posted to any website not affiliated with ASU will result in academic integrity disciplinary actions against the students posting them and the students using them.

Accessibility Statements

View the **ASU Online Student Accessibility (https://asuonline-dev.asu.edu/qm-template/CanvasQM/qm-accessibility.html)** page to review accessibility statements for common tools and resources used in ASU Online courses.

Syllabus Disclaimer

The syllabus is a statement of intent and serves as an implicit agreement between the instructor and the student. Every effort will be made to avoid changing the course schedule but the possibility exists that unforeseen events will make syllabus changes necessary. **Remember to check your ASU email and the course site often.**

Please navigate the course through the Modules.