MATH 3306: Linear Algebra

Sul Ross State University Rio Grande College
Fall 2023

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Course Description	MTH 3306 Linear Algebra is intended as an introduction to systems of linear equations, matrices, determinants, vector spaces, linear transformations, eigenvalues and eigenvectors, applications, and numerical methods.
Mathematics Program Outcomes	(1) The student will be able to demonstrate content knowledge of basic mathematical principles. (2) The student will be proficient in logic, able to negate statements, provide counterexamples to false statements, and determine the validity of arguments. (3) The student will be able to communicate mathematical content clearly and with valid reasoning.
Marketable Skills	(1) Logical and analytical skills. (2) Problem-solving using analytic and algebraic methods. (3) Use of technology in problem-solving and presentation. (4) Communication and pedagogical skills.
Class Meetings	Tuesday and Thursday, 2:00 – 3:15
Class Location	Del Rio 103; Eagle Pass B113; Uvalde B114
Text	Kuttler, *A First Course in Linear Algebra* (OER Commons)

Course Policies

Attendance Policy

Attendance is mandatory. Students are expected to attend class in person in their classroom of registration unless permission is given for extenuating circumstances. You will be held responsible for all material covered in class or in the reading assignments. If you have to miss a class, it is your responsibility to obtain all notes, assignments, and announcements from someone else in the class. Make-up exams will be given only in the event of an emergency, in which case written justification and/or documentation must be provided and approved.

Communication

I will post course documents, reminders, announcements, and assignments on the Blackboard system. You will also submit homework on Blackboard. I may also occasionally send announcements via e-mail. You should make sure you know how to access and use these tools. You are welcome to e-mail, telephone, or text me. However you chose to contact me, please make sure to state your name at the beginning of any message.

You are welcome to stop by my office if you wish to speak about the content or your progress in the course. Sometimes meetings come up, so it's best to contact me ahead of time if you intend

to travel to Uvalde to see me in person.

I am here to help you! Ask questions in class, call me, e-mail me, text me, or come to my office. If you don't communicate with me, then I can't help you.

Grading Policy

Your grades will be weighted as follows:

Participation	10%
Homework	25%
Midterm Exam	25%
Final Exam	40%

A student who averages at least 90% will receive an A; at least 80% will receive at least a B; at least 70% will receive at least a C; at least 60% will receive at least a D.

Participation

Your participation grade will be assigned depending on your class attendance and participation in class activities. Simply put, if you always come to class, seem like you're trying to pay attention and take notes, and take part in class activities, then you will get full credit.

Homework

Homework is the most essential component of the course. It is important that you attempt to complete each assignment before the next class period. This will allow us to make the most of our time together. We will always have time in class to discuss homework.

Each week, you will submit exercises to be graded for correctness. Homework can be submitted in a variety of formats, but each assignment must be submitted as a single file that I can view and grade on Blackboard.

One possibility would be to type up your homework using the Equation Editor on Microsoft Word and save it as a PDF. Another would be to capture high-quality images of your homework using a phone or other device and combine into a single file, e.g. by pasting each image into a word processor file. Feedback will be provided in the form of comments your Blackboard file.

All work must be shown for full credit. Try to be as tidy as possible so that I can understand your work. I'm flexible as to file format provided I can view your submission on Blackboard. Submissions consisting of multiple image files will not be graded as it's too easy for me to lose my place and miss something. If I have trouble seeing your file, I will let you know and give you a chance to resubmit.

Note that, as a student, you can access Microsoft products for free at

https://www.sulross.edu/oit

Exams

There will be one midterm exam. Its tentative date is Tuesday, October 17. This is subject to change. You will be notified of a change at least one week in advance. Make-up exams will be given only in the event of an emergency, in which case written justification and/or documentation

must be provided and approved.

The comprehensive final exam will take place at the time scheduled by the university, on Monday, December 11, from 2 – 4 p.m.

Subject Outline

Below is a tentative outline of the subjects we will cover in this course. As time allows, we will also make excursions into the practical aspects of mathematics education among underserved populations in a region with limited access to educational resources.

I. Systems of Equations: *the geometry of systems of linear equations – algebraic procedures – Gaussian elimination – reduced row-echelon form – rank and homogeneous systems – application: chemical reactions – application: resistor networks*

II. Matrices: *addition and scalar multiplication – multiplication of matrices – properties of matrix multiplication – the transpose – the indentity and inverses – finding the inverse of a matrix – elementary matrices – more on inverses*

III. Determinants: *cofactors and* 2×2 *determinants – the determinant of a triangular matrix – properties of determinants – finding determinants using row operations – the determinant of an inverse – Cramer's Rule – polynomial interpolation*

IV. Linear Algebra in $\mathbb{R}^n$: *vectors in* $\mathbb{R}^n$ *– the geometry of vector arithmetic – parametric lines – the dot product – planes in* $\mathbb{R}^n$ *– the cross product – spanning, linear independence, and basis – orthogonality and the Gram Schmidt process – applications*

V. Linear Transformations: *linear transformations and matrices – properties of linear transformations – special linear transformations in* $\mathbb{R}^2$ *– one-to-one and onto transformations – isomorphisms – kernel and image – the matrix of a linear transformation – the general solution of a system*

VI. Eigenvalues and Eigenvectors: *basic concepts – finding eigenvalues and eigenvectors – diagonalization – applications*

VII. Vector Spaces: *basic definition – spanning sets – linear independence – subspaces and basis – sums and intersections – linear transformations – isomorphisms – kernel and image – matrices*

Schedule

This schedule is tentative only. The unit numbers refer to the above outline.

August 29 – September 12	Unit I
September 12 – 28	Unit II
September 28 – October 12	Unit III
October 17	**Midterm Exam**

October 19 – November 9	Unit IV
November 12 – 21	Unit V
November 22 – 24	*Thanksgiving Break*
November 28 – December 5	Unit VI
December 11, 2 – 4 p.m.	**Final Exam**

University Statements

Distance Education Statement. *Students enrolled in distance education courses have equal access to the university's academic support services, such as library resources, online databases, and instructional technology support. For more information about accessing these resources, visit the SRSU website.*

Students should correspond using Sul Ross email accounts and submit online assignments through Blackboard, which requires a secure login. Students enrolled in distance education courses at Sul Ross are expected to adhere to all policies pertaining to academic honesty and appropriate student conduct, as described in the student handbook. Students in web-based courses must maintain appropriate equipment and software, according to the needs and requirements of the course, as outlined on the SRSU website. Directions for filing a student complaint are located in the student handbook.

SRSU Accessibility Services. *Sul Ross State University (SRSU) is committed to equal access in compliance with the Americans with Disabilities Act of 1973. It is SRSU policy to provide reasonable accommodations to students with documented disabilities. It is the student's responsibility to initiate a request each semester for each class. Students seeking accessibility/accommodations services must contact Mrs. Mary Schwartze Grisham, LPC, SRSU's Accessibility Services Director at 432-837-8203 or email mschwartze@sulross.edu. Our office is located on the first floor of Ferguson Hall, room 112, and our mailing address is P.O. Box C122, Sul Ross State University, Alpine. Texas, 79832.*

Counseling Services. *Sul Ross has partnered with TimelyCare where all SR students will have access to nine free counseling sessions. You can learn more about this 24/7/356 support by visiting Timelycare/SRSU. The SR Counseling and Accessibility Services office will continue to offer in-person counseling in Ferguson Hall room 112 (Alpine campus), and telehealth Zoom sessions for remote students and RGC students.*

Libraries. *The Bryan Wildenthal Memorial Library in Alpine offers FREE resources and services to the entire SRSU community. Access and borrow books, articles, and more by visiting the library's website, library.sulross.edu. Off-campus access requires logging in with your LobolD and password. Librarians are a tremendous resource for your coursework and can be reached in person, by email (srsulibrary@sulross.edu), or by phone (432-837-8123).*

No matter where you are based, public libraries and many academic and special libraries welcome the general public into their spaces for study. SRSU TexShare Cardholders can access additional services and resources at various libraries across Texas. Learn more about the TexShare program by visiting library.sulross.edu/find-and-borrow/texshare or ask a librarian by emailing srsulibrary@sulross.edu.

Mike Fernandez, SRSU Librarian, is based in Eagle Pass (Building D-129) to offer specialized library services to students, faculty, and staff. Utilize free services such as InterLibrary Loan (ILL) and ScanIt to get materials delivered to you at home or via email.