



Course Title: Linear Algebra
Course #: MAH 410-01
Credit Hours: 3
Semester: Spring 2022

Instructor: Abdulmtalb Hussen, Ph.D.

Primary Contact: Blackboard, WebAssign

Email address: ahussen@navajotech.edu

Meetings: In Person

Class Location: SUB 213

Office: Nursing Building 211

Class Meeting Times: Monday & Wednesday 12:00 PM – 1:15 PM

Office Hours: After Class, By Appointment

Welcome to MTH 410-01- Linear Algebra. I am so happy to get a chance to teach this course and am hoping that we have a very wonderful semester together.

Required Materials:

Textbook: Elementary Linear Algebra, 8th Edition

Ron Larson

ISBN-13: 978-1-305-65801-1

ISBN-10: 1-305-65801-9

Tools: Scientific Calculator / Graphing Calculator

Required software: WebAssign Access code. WebAssign is accessed through Blackboard. You will use this to do online homework. The access code is needed to access the course. You can also access the text. **Please contact the book store to buy the access code as soon as possible.**

Pre-requisite: A grade of C or better in MATH 1520 Calculus II

Mission Statement

Navajo Technical University's mission is to provide college readiness programs, certificates, associate, baccalaureate, and graduate degrees. Students, faculty, and staff will provide value to the Diné community through research, community engagement, service learning, and activities designed to foster cultural and environmental preservation and sustainable economic development. The University is committed to a high quality, student-oriented, hands-on-learning environment based on the Diné cultural principles: *Nitsáhákees, Nahátá, Íina, Siihasin.*

Course Description

An introduction to Linear Algebra will cover systems of equations, matrices, vector spaces, and linear transformations with some applications. At times, the learning process relating to the Navajo

culture in the areas of Nitsahakees, Nahatah, Iina, and Sihasin will be covered as well as other cultures (multi-cultural studies).

MTH 410 Schedule, Spring 2022	
Week	Chapters Covered
1 01/17	Chapter 1: Systems of Linear Equations: Section 1.1 Martin Luther King Jr. Day, Jan 17, 2022 Last Day Add/Drop Classes w/out W, Jan 21, 2022
2 01/24	Chapter 1: Systems of Linear Equations, Section 1.2
3 01/31	Chapter 2: Matrices: Section 2.1 & Section 2.2 & Quiz 1
4 02/07	Chapter 2: Matrices: Section 2.3 Chapter 3: Determinants :Section 3.1
5 02/14	Chapter 3: Determinants Section 3.2 & Section 3.3& Quiz 2
6 02/21	Chapter 3: Determinants: Section 3.4 Holiday – President’s Day, Feb 21, 2022 Spring Graduation Petitions Due, Feb 25, 2022
7 02/28	Chapter 4: Vector Spaces : Section 4.1 & Section 4.2& Section 4.3 & Quiz 3
8 03/07	Review & Midterm Exam
9 03/14	Spring Break Mar 14 – 18, 2022
10 03/21	Chapter 4: Vector Spaces: Section 4.4 & Section 4.5 & Section 4.6
11 03/28	Chapter 5: Inner Product Space Section 5.1& Section 5.2 & Section 5.3 & Quiz 4 Last day to Withdraw With a W, Mar 31, 2022
12 04/04	Chapter 6: Linear Transformations: Section 6.1
13 04/11	Chapter 6: Linear Transformations: Section 6.2 & Quiz 5
14 04/18	Chapter 6: Linear Transformations: Section 6.3
15 04/25	Chapter 7: Eigenvalues and Eigenvectors: Section 7.1 & Quiz 6
16 05/02	Chapter 7: Eigenvalues and Eigenvectors: Section 7.2
17 05/09	Final Exam

Student Learning Outcomes:

1. Analyze and solve systems of equations.

- a. Determine if a system is linear.
- b. Determine if a system is consistent and whether or not solutions are unique.
- c. Solve systems using row reduction and analyze the system using pivot positions and free variables.
- d. Solve systems using matrix factorizations.
- e. Solve systems using matrix inverses.
- f. Apply Cramer's rule.

2. Analyze and use the properties of vectors and vector spaces.

- a. Use vector algebra.
- b. Determine whether or not a set of vectors is linearly independent.
- c. Determine whether or not a set of vectors and its operations constitute a vector space.
- d. Determine whether or not a subset of a vector space is a subspace.
- e. Determine whether or not a set of vectors spans or is a basis for a vector space.
- f. Compute a basis for and determine the dimension of a vector space.
- g. Compute the coordinates of a vector with respect to a basis.
- h. Compute the transition matrix between two bases.
- i. Determine whether a set and its product constitute an inner product space.
- j. Compute lengths, angles, distances, and orthogonal projections of vectors.
- k. Verify orthonormal bases and compute them using the Gram-Schmidt process.

3. Analyze and use the properties of matrices and linear transformations.

- a. Use matrix algebra.
- b. Compute the inverse, determinant, transpose, and eigenpairs of a matrix.
- c. Compute and apply decompositions of matrices, such as LU decompositions, singular-value decompositions, diagonalizations, and orthogonal diagonalizations of symmetric matrices.
- d. Use the Invertible Matrix Theorem.
- e. Compute a basis for the row, column, and null spaces of a matrix.
- f. Determine the rank and nullity of a matrix and know how they are related.
- g. Determine whether or not a transformation is linear.
- h. Determine whether or not a transformation is injective (one-to-one), surjective (onto), or bijective (both).
- i. Compute the standard matrix, kernel, and range of a linear transformation.

4. Solve applied problems and use technology

- a. Set up and solve applied problems such as flow networks, electric circuits, population dynamics, Markov chains, etc.
- b. Solve least-squares problems.
- c. Use a computer program to perform the computational outcomes above.

Grading

Quizzes	25%
Homework/ Classwork	20%
Midterm	25%
Class Participation / Attendance	5%
Final Exam	25%
Total	100%

Grading Scale:

Class Percentage	Letter Grade
90-100 %	A
80-89 %	B
70-79 %	C
60-69 %	D
< 60 %	F

Assessment Pieces:

The student will be assessed in a variety of ways:

- Quizzes/Midterms / Finals
- Presentation/Project
- Regular formative assessments like classwork and homework
- Informal assessments like recitation or teacher observation

Course Policies:

Student accountability is one key component to success. In order to achieve desired results in learning concepts in Calculus, the students are encouraged to practice solving problems to reinforce the lesson. Furthermore class participation will allow the students to share their ideas through their different learning styles. Cheating and plagiarism are strictly forbidden of which include copying other student's work, lifting text from copyrighted published work, and other similar forms of infringement.

Class Expectations:

1. Class starts on time and ends on time
2. Participate in class activities
3. Use of electronic devices are prohibited (in case of emergency notify the teacher).
4. In case of makeup test a valid written note is required
5. Be respectful at all times

Participation

Students are expected to attend and participate in all class activities- as listed above, as it may accumulate as part of 5% of the grade. Points will be given to students who actively participate in class activities that include cooperative learning activities, discovery learning activities, classwork, and sharing.

Electronic Devices Policy:

For courtesy sake, please turn cell phones off or place them on silence or vibrate mode BEFORE coming to class. Also, answer cell phones **OUTSIDE OF CLASS** (not in the classroom).

Exercising cell phone use courtesy is appreciated by both the instructor and classmates.

Headphones are to be removed before coming to class.

Attendance Policy:

Students are expected to regularly attend all classes for which they are registered. A percentage of the student's grade will be based on class attendance and participation. Absence from class, regardless of the reason, does not relieve the student of his/her responsibility to complete all course work by the required deadlines. Furthermore, it is the student's responsibility to obtain notes, handouts, and any other information covered when absent from class and to arrange to make up any in-class assignments or tests if permitted by the instructor. Incomplete or missing assignments will necessarily affect the student's grades. Instructors will report excessive and/or unexplained absences to the Counseling Department for investigation and potential intervention.

Instructors may drop students from the class after three (3) absences unless prior arrangements are made with the instructor to make up work and the instructor deems any excuse acceptable.

Late Attendance: If instructor is late for 15 minutes without informing students, class will automatically be canceled. If student is late for 15 minutes or more, will be considered as an absent.

Note: (1) Missing a lot of classes may jeopardize a student's chance to earn enough percentage to pass. (2) Excused absences (i.e. with doctor's slip) will not jeopardize attendance percentage but missed works are never excused. Rare instances will not be sufficient to jeopardize grades but recurring instances may. **See also Late Assignments / Work**

Late Assignments or Work

Due dates are assigned during the class. Practice assignments done in class are due the same day unless the teacher assigns an extension date of submission. Submitting work beyond the date will incur a grade penalty. Scores will be capped to 60% for up to 2-day late submissions. Submitting work that is 2-days late will not receive any more grades but the teacher will accept the work for completion purposes.

Make-up Quiz / Test:

A student who misses a quiz / test can schedule a make-up Test. The window of opportunity for the make-up assessment is up to a week after the quiz / test date. The teacher may opt not to give any make-up assessment beyond the week or upon returning the graded quiz. Failure to do the

quiz/test means a grade of zero for that particular assessment.

Study Time Outside of Class for Face-to-Face Courses

For every credit hour spent in a class, a student is expected to spend two hours (2) outside of class studying the course materials.

Academic Integrity

Integrity (honesty) is expected of every student in all academic work. The guiding principle of academic integrity is that a student's submitted work must be the student's own. Students who engage in academic dishonesty diminish their education and bring discredit to the University community. Avoid situations likely to compromise academic integrity such as: cheating, facilitating academic dishonesty, and plagiarism; modifying academic work to obtain additional credit in the same class unless approved in advance by the instructor, failure to observe rules of academic integrity established by the instructor.

Diné Philosophy of Education

The Diné Philosophy of Education (DPE) is incorporated into every class for students to become aware of and to understand the significance of the four Diné philosophical elements, including its affiliation with the four directions, four sacred mountains, the four set of thought processes and so forth: Nitsáhákees, Nahát'á, Íina and Siih Hasin which are essential and relevant to self-identity, respect and wisdom to achieve career goals successfully.

Students with Disabilities

The Navajo Technical University and the Math department are committed to serving all enrolled students in a non-discriminatory and accommodating manner. Any student who feels he/she may need an accommodation based on the impact of disability, or needs special accommodations should inform NTU in accordance with the procedures of the subsection entitled "Students with Disabilities" under Section 7: Student Support Programs, NTU Student Handbook.