# MATH 220: Linear Algebra

# Syllabus Winter 2021

Stephanie Bostwick

[sbostwick@nwic.edu](mailto:mgladstone@nwic.edu)

(360) 392-4275

building #4 office #210

Credits: 5

Class Time: TBD, & Canvas online classroom

Office Hours:

***NWIC MISSION STATEMENT***

*Through education, Northwest Indian College promotes   
Indigenous self-determination and knowledge*

**Course Prerequisites:** MATH 126

# Required Text

None.

# Course Description

Introduces matrix theory. Topics covered include: systems of equations, Gaussian elimination, LU decomposition, Euclidean vector spaces and subspaces, linear transformations, basis sets and dimensions, span of a vector space, Gram-Schmidt orthogonalization, least squares methods, eigenvalues, eigenvectors, and matrix diagonalization. Focuses on key vocabulary and conceptual understanding of Linear Algebra. Real world applications are emphasized.

# Course Outcomes

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

1. Perform matrix operations, calculate determinants, find inverses for matrices (where possible), and find the transpose of a matrix
2. Use elementary row operations to solve systems of linear equations using Gaussian Elimination and Gauss-Jordan reduction methods
3. Apply LU decomposition methods to factorize a matrix
4. Identify a system of linear equations as independent, inconsistent, or dependent
5. Identify properties of Euclidean vector spaces and the effects of linear transformations
6. Perform vector operations; use properties of vector operations; and determine vector subspaces, spanning sets, and bases of vector spaces
7. Determine whether a set of vectors forms the basis for a set and find the dimension of a subspace
8. Find inner products and a basis for a given inner product space
9. Use matrices to perform transformations between vector spaces
10. Find the kernel, range, rank, and nullity of a linear transformation
11. Use Gram-Schmidt orthogonalization to find orthonormal vectors
12. Apply QR decomposition methods to factorize a matrix
13. Find real eigenvalues and eigenvectors of a square matrix
14. Diagonalize symmetric matrices
15. Apply matrix algebra to data fitting and least squares analysis

# NWIC Institutional Outcomes

1. Effectively communicate in diverse situations, from receiving to expressing information, both verbally and non-verbally

1. Meet the technological challenges of a modern world
2. Work cooperatively toward a common goal

**Course Requirements and Expectations**

Students who have a valid issue that prevents them from attending class need to notify the instructor prior to the start of class, email messaging is preferred but phone message is acceptable. It is understood in some situations an absence will be unavoidable. In those situations students will be given the opportunity to make up attendance and participation by watching recordings of the class session that has been missed. Embedded in the recorded class session will be participation questions. If those questions are answered and submitted to the instructor within 1 week of the scheduled class session, attendance and participation points will be awarded based on the agreement reached between student and instructor.

Any exceptions to this attendance policy must be approved by the Department Chair and the instructor in writing before the start of the quarter.

***It will not be possible to earn a passing grade if a student misses more than 30% of this class without notifying the instructor.***

**Evaluation & Assessment**

|  |  |
| --- | --- |
| Homework Problem Presentations | 20% |
| Projects | 20% |
| Quizzes | 10% |
| Midterms | 30% |
| Final Exam | 20% |

Grading will be on a percentage system as detailed below:

* 1. Homework Problem Presentations – Each homework assignment will require that select problems are worked out in detail and submitted in class. Late assignments will receive a 10% deduction for each late day past the due date. weight – 20%
  2. Projects - There will be a group project with bi-weekly individual assignments due. weight – 20%
  3. Quizzes – There will be daily quizzes at the beginning of class covering topics from the previous class period, excluding exam days. Students must be in class to take the quiz. The lowest score will be dropped at the end of the quarter. No makeups. weight – 10%
  4. Midterm Exams – There will be 3 midterm exams throughout the quarter – see Canvas for expected dates. No makeups will be allowed without prior permission given by instructor. weight – 30%
  5. Final Exam – Comprehensive exam at the end of the quarter. No makeups will be allowed without prior permission given by instructor. weight – 20%

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# Course and Assignment Schedule:

**Tentative schedule**

**Week1-2:** Introduction to matrix algebra, Determinants and applications

**Week 3-4:** Solving systems of equations , LU decomposition. Matrix applications.

**Week 4-7:** Vector spaces and linear transformations, Span and basis of a vector space

**Week 7-8:** Gram Schmidt orthogonalization, QR factorization, Least square Methods and Data fitting

**Week 9-11:** Eigenvalues and Eigenvectors, Matrix diagonalization and Applications

**Instructor(s) Discretion:**

Should it be deemed necessary, the instructor(s) of this course reserves the right to make alterations, at any time, to the course materials or what is contained within this syllabus in order to improve the course itself, the learning environment or the opportunity for student success. If such a change is made, it will be made in a timely manner so as not to impede the learning process or interfere, in any way, with student success.