Fall 9-1-2020

M 221.01: Introduction to Linear Algebra

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M 221-01 LINEAR ALGEBRA FALL SEMESTER 2020

This syllabus contains information about this class. Please read this carefully and keep it for future reference (in case you loose it, a copy of the syllabus will be posted on the class Moodle page). In case you have questions, please do not hesitate to ask me. A good time for questions is right after class or during office hours.

INSTRUCTORS: Javier Perez Alvaro (Office: Math 301)
Email: javier.perez-alvaro@mso.umt.edu

OFFICE HOURS: See http://www.umt.edu/people/perezalvaro for up-to-date office hours

PREREQUISITE: M172 or M182, or consent of instructor

MOODLE PAGE: Homework assignments and other information pertinent to this course will be posted at the Moodle web site.

TEXT: None required
RECOMMENDED: *Introduction to Linear Algebra*, by Gilbert Strang.

This course covers matrix theory and linear algebra, emphasizing topics useful in other disciplines. Linear algebra is a branch of mathematics that studies systems of linear equations and the properties of matrices. The concepts of linear algebra are extremely useful in machine learning, data science, physics, economics and social sciences, natural sciences, and engineering.

After successfully completing the course, you will have a good understanding of the following topics and their applications:

- Systems of linear equations
- Matrix operations, including inverses
- Row reduction and echelon forms
- Linear dependence and independence
- Subspaces and bases and dimensions
- Orthogonal bases and orthogonal projections
- Gram-Schmidt process
- Linear models and least-squares problems

- Determinants and their properties
- Eigenvalues and eigenvectors
- Diagonalization of a matrix
- Symmetric matrices
- The Singular Value Decomposition

Learning Outcomes: The learning goals for this course are:

- Solve systems of linear equations and solve matrix equations;
- Identify linearly dependent and independent sets of vectors;
- Compute bases for column, row and null spaces;
- Represent linear transformations with matrices;
- Compute and use determinants;
- Compute eigenvalues and eigenvectors, and determine if a matrix is diagonalizable;
- Determine and use orthogonality;
- Use linear algebra to solve basic applied problems;
- Prove elementary statements in linear algebra.

Grading:

- Tests: There will be three one-hour exams at class times and a final exam. All of these exams are closed book exams.
- Final Exam: There will be a final exam on all material covered in the course.
- Homework: There will be weekly homework assignments. The homeworks are essential in learning linear algebra. They are not a test and you are encouraged to talk to other students about difficult problems–after you have found them difficult. But you must write your own solutions.

  Some homework problems will require you to use The Numerical Python Library (NumPy), an important tool for numerical linear algebra. No previous Python experience is required in M221.

Getting Python: You can download Python from Python.org. If you don't already have Python, I recommend instead installing the Anaconda distribution, which already includes most of the Python libraries that you need to do Linear Algebra.

Zoom: Students attending remotely, please use the following Zoom ID

ID: 937 0574 0658

Passcode: linalg

Safety:

- Mask use is required within the classroom
- Each student is provided with a cleaning kit. The expectation is that students will clean their personal work space when they arrive for class, and before they leave the classroom
- The classroom has one-way entrance / exit to minimize crowding
- Students are discouraged from congregating outside the classroom before and after class
- Drinking liquids and eating food is discouraged within the classroom (which requires mask removal)
- Stay home if you feel sick and/or if exhibiting COVID-19 symptoms
- If you are sick or displaying symptoms, please contact the Curry Health Center at (406) 243-4330
- Up-to-Date COVID-19 Information from the University of Montana UM Coronavirus Website: https://www.umt.edu/coronavirus UM COVID-19 Fall 2020 website: https://www.umt.edu/coronavirus/fall2020.php

Digital Access: Digital devices (like laptops and cell phones) are becoming increasingly important to success in college. I recognize that some students are unable to afford the cost of purchasing digital devices and that other students rely on older, more problem-prone devices that frequently break down or become unusable. I also recognize that those technology problems can be a significant source of stress for students. Given those challenges, I encourage students to contact me if you experience a technology-related problem that interferes with your work in this course.

Assessment: 15% Homework
60% Three Exams
25% Comprehensive Final Exam

Grade Scale:

$\geq 93\%$	90%	87%	83%	80%	75%	70%	65%	62%	58%	55%	$\leq 55\%$
A	A^-	B^+	B	B^-	C^+	C	C^-	D^+	D	D^-	F

University dates and deadlines: You should be aware of the important dates and deadlines posted by the **Registrar's Office**.

Important note: Announcements made in class are considered addenda to this syllabus. Make sure you stay informed as to the progress of the class.

HONESTY: All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code. The Code is available for review online at http://www.umt.edu/vpesa/Dean of Students/default.php.

ACCOMMODATION: The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors and Disability Services for Students (DSS). If you think that you may have a disability adversely affecting you academic performance, and you have not already registered with DSS, please contact DSS in Lommassen 154. I will work with you and DSS to provide an appropriate accommodation.