

THE PENNSYLVANIA STATE UNIVERSITY
MONT ALTO CAMPUS
Fall 2023

MATH 220 – Matrices

Course Title: MATH 220 "Matrices"

Section: 001

Credits: 3

Class Meeting: 11:15 AM – 12:05 PM, General Studies 207

Text and Material: Fundamentals of Matrix Algebra 3rd Edition, by Gregory Hartman (available on Canvas)

Instructor: Dr. Jacob Moore, Associate Professor of Engineering

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Phone: (717) 749-6209

Office Location: 7 Bookstore Building

Office Hours: Monday 9AM – 10AM, Wednesday 9AM – 10AM, Thursdays 10AM – 12PM, or by appointment

Course Goals:

Matrices is a course that teaches the core concepts and methods of matrix arithmetic: vector spaces, linear transforms, Gaussian elimination, dimension, eigenvectors, and orthogonality. It is a required course for many students majoring in engineering, science, or secondary education.

Course Learning Objectives:

Upon successfully completing this course students will be able to...

- Measure angles in both degrees and radians and be able to convert between the two.
- Add and subtract angles and be able to determine the angles as measured from different reference axes.
- Use right angle trigonometry relationships to relate angles and side/hypotenuse lengths in triangles.
- Apply double angle identities to trigonometric relationships.
- Apply trigonometric functions in the modeling of physical systems.
- Solve trigonometric functions for unknown values.
- Verify key trigonometric relationships
- Apply the law of sines and law of cosines to non-right triangles
- Apply trigonometric relationships in the modeling of vectors, polar equations, and the trigonometric form of complex numbers.

Course Policies:

Attendance:

- Students are expected to attend all classes except in cases of illness or other extenuating circumstances.
- Students experiencing any symptoms of COVID 19, or those who were exposed to someone testing positive or presumed positive should not attend class and should alert the instructor. If possible, these students will be encouraged to continue to participate remotely.
- Class will begin promptly at the designated time, and you are expected to be ready to go at that point.
- Each unexcused absence will result in losing one point from your attendance grade, up to a maximum of 5 points.
- Students should contact the instructor before class for any pre-scheduled absences. In the case of an illness or another unexpected reason for absence, the student should contact the instructor as soon as possible.
- It is the responsibility of the student to determine what activities and assignments were missed in the case of any missed classes or significant tardiness. This can be done by contacting the instructor. Not all assignments may be made up in the case of non-university sanctioned excuses for absence.

Assignments:

- All assignments will be graded according to the mastery grading system. For details on this system, see the section on “Mastery Assignment Grading”.
- All assignments and dues dates will be documented on Canvas (<https://psu.instructure.com>).
- All homework should be neat and easy to follow. Assignments that are incomprehensible and assignments that do not show enough work may require resubmission
- All assignments are due at the beginning of class on the listed due date. Assignments should be dropped off with the instructor in class. Late assignments will not be accepted without prior consent of the instructor.
- Students are encouraged to work in groups; however, students are expected to complete and submit their own original work.

Tests:

- Tests will be conducted during the class periods indicated on the schedule unless otherwise noted in class. Because of this the tests will be limited to the regular 50-minute time period. Time starts at the beginning of class regardless of when the student shows up.
- Students are allowed to have one page of notes (standard size page, front and back) and a scientific calculator during the test period.
- The tests will consist of two main sections:

- The basics section will cover the fundamentals of the topics covered in class and consist of a combination of multiple choice and open response style questions. Students will be expected to answer all the questions in this section.
- The challenge section will cover more complex topics and may string various topics together. This section will consist entirely of open response style questions and students will be expected to choose and solve a subset of the questions.

General Conduct:

- Students are expected to act professionally during all class related activities and meetings. Inappropriate behavior or language during any class activities will not be tolerated.

Mastery Assignment Grading:

The purpose of having assignments in this class is to help students learn the material and mastery the skills covered in the course. Students are expected to show mastery of the material through complete and correct solutions to the homework assignments, though it is understood that this may not happen the first-time students attempt to solve a problem. To match this expectation, the following process will be used to grade all homework assignments unless otherwise noted.

1. Students will be given a weekly assignment with several homework problems in the class readings. Students must complete all problems to the best of their abilities, completely document all their work and turn in their work by the assigned due date.
2. Within one week, the instructor will grade and return the assignment. Each problem will have one of three marks on it, indicating whether the instructor feels the problem was mastered.
 - **M (Mastered):** Indicating that the student completely and correctly answered the problem.
 - **NM (Not Mastered):** Indicating that the student did not completely and correctly answer the problem. This will be accompanied by comments from the instructor indicating any mistakes or missing information that the instructor has identified.
 - **X (Not Attempted):** Indicating that the instructor felt that the student did not make a reasonable attempt at answering the problem.
3. All problems that were marked NM (Not Mastered) can be redone and resubmitted within one week of being returned. Problems may not be resubmitted more than one week after being returned (due dates will be printed on the assignments). All problems resubmitted will be regraded and just as the original assignment was. The new marks for each problem will replace the previous marks the student received. Resubmissions should be written on a separate sheet and must be stapled to the front of the original assignment and any previous resubmissions. The whole problem must be written out again unless the instructor has marked a “continue from here” point in the previous submission.
4. Problems can be resubmitted as many times as needed so long as the problem is marked NM.
5. The last day of classes will be the last day to resubmit any assignment. After this date, no more resubmissions will be accepted.

6. Each student's final course homework grade will be the number of problems the student has marked as mastered over the total number of problems assigned to the class.

Services for Students with Disabilities:

In order to receive consideration for reasonable accommodations, you must contact the Disability Coordinator, Kendra Wolgast, located on the first floor of the General Studies Building in the Student Success Center. Appointments can be made at <https://psu.mywconline.com/>. She can also be reached at 749-6045 or kmw24@psu.edu. Students must complete an introductory meeting and provide documentation: <http://equity.psu.edu/sdr/guidelines>. If the documentation supports your request for reasonable accommodations, the disability services office will provide you with an accommodation letter. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. You must follow this process for every semester that you request accommodations.

Counseling and Psychological Services:

Many students at Penn State face personal challenges or have psychological needs that may interfere with their academic progress, social development, or emotional wellbeing. The university offers a variety of confidential services to help you through difficult times, including individual and group counseling, and crisis intervention. Mantra Health Telepsychiatry services offer evaluations and limited medication prescriptions. Penn State students receive limited sessions free of charge. These services are provided by staff who welcome all students and embrace a philosophy respectful of clients' cultural and religious backgrounds, and sensitive to differences in race, ability, gender identity and sexual orientation.

To schedule an appointment contact:

Counseling Services
Darlene Pasi, M.S., LPC
204 Wellness House
Drp16@psu.edu
Phone: 717-749-6125

Penn State Crisis Line (24 hours/7 days/week): 877-229-6400
Crisis Text Line (24 hours/7 days/week): Text LIONS to 741741

Academic Support Center:

The Academic Support Center provides academic and skill building support for all students. If you are having difficulty in any of your classes, or with academic skills, contact the Academic Support Center.
E-mail: ASC-Helps@psu.edu
Call: (717) 749-6046
Schedule a Tutoring Appointment: <http://www.psu.mywconline.com>
Stop by: 1st floor of the General Studies Building

Academic Integrity:

According to Penn State policy G-9: Academic Integrity, an academic integrity violation is “an intentional, unintentional, or attempted violation of course or assessment policies to gain an academic advantage or to advantage or disadvantage another student academically.” Unless your instructor tells you otherwise, you must complete all course work entirely on your own, using only sources that have been permitted by your instructor, and you may not assist other students with papers, quizzes, exams, or other assessments. If your instructor allows you to use ideas, images, or word phrases created by another person (e.g., from Course Hero or Chegg) or by generative technology, such as ChatGPT, you must identify their source. You may not submit false or fabricated information, use the same academic work for credit in multiple courses, or share instructional content. Students with questions about academic integrity should ask their instructor before submitting work.

Students facing allegations of academic misconduct may not drop/withdraw from the affected course unless they are cleared of wrongdoing (see G-9: Academic Integrity). Attempted drops will be prevented or reversed, and students will be expected to complete course work and meet course deadlines. Students who are found responsible for academic integrity violations face academic outcomes, which can be severe, and put themselves at jeopardy for other outcomes which may include ineligibility for Dean’s List, pass/fail elections, and grade forgiveness. Students may also face consequences from their home/major program and/or The Schreyer Honors College.

Reporting Educational Equity Concerns:

Consistent with University Policy AD29, students who believe they have experienced or observed a hate crime, an act of intolerance, discrimination, or harassment that occurs at Penn State are urged to report these incidents as outlined on the University’s Report Bias webpage (<http://equity.psu.edu/reportbias/>)

Grading Policy:

Grades will be distributed as follows:

- Attendance (5%)
- Labs 10% (2 labs)
- Homework Assignments 20%
- Midterm Exams 45% (3 exams 15% Each)
- Final Exam 20%

Final letter grade will be assigned as follows:

93 - 100	A
90 – 92.99	A-
87 – 89.99	B+
83 – 86.99	B
80 – 82.99	B-
77 – 79.99	C+
70 – 76.99	C

60 – 69.99	D
below 60	F

Tentative Schedule:

Week of	Topic	Pre-Class Reading	Assignments Due
8/21	M- Course Introduction W- Matrix Basics F – Systems of Linear Equations	1.1	
8/28	M – Using Matrices to Solve Linear Equations W – Elementary Row Operations F – Elementary Row Operations cont.	1.2 1.3	W – HW1
9/4	M – Labor Day No Class W – Existence and Uniqueness of Solutions F – Technology Tools	1.4	F – HW2
9/11	M – Linear Systems Applications W – Review for Exam F – Exam 1	1.5	W – HW3
9/18	M – Matrix Addition and Scalar Multiplication W – Matrix Multiplication F – Matrix Multiplication cont.	2.1 2.2	
9/25	M – Visualizing Matrix Arithmetic in 2D W – Vector Solutions to Linear Systems F – Vector Solutions to Linear Systems cont.	2.3 2.4	M – HW4
10/2	M – Solving Matrix Equations and the Matrix Inverse W – Properties of the Matrix Inverse F – Review for Exam	2.5 – 2.6 2.7	M HW5 F – HW6
10/9	M – Exam 2 W – Large Matrix Lab F – Large Matrix Lab		
10/16	M – The Matrix Transpose W – The Matrix Trace F – The Determinate	3.1 3.2 3.3	M – Lab 1 F – HW7
10/23	M – The Determinate cont. W – Properties of the Determinate F – Cramer’s Rule	3.4 3.5	F – HW8
10/30	M – Cramer’s Rule cont. W – Review for Exam F – Exam 3		W – HW 9
11/6	M – Eigenvectors and Eigenvalues W – Eigenvectors and Eigenvalues cont. F – Properties of Eigenvectors and Eigenvalues	4.1 4.2	
11/13	M – Properties of Eigenvectors and Eigenvalues cont. W – Vector Transformations F – Properties of Linear Transformations	5.1 5.2	W – HW 10
11/20	No Class, Thanksgiving Break		
11/27	M – Vectors in Three Dimensions W – Vector Transformation Lab F – Vector Transformations Lab	5.3	W – HW 11
12/4	M – Dot Products W – Cross Products F – Review for Final		M – Lab 2 F – HW 12
12/11	Final Exam, Finals Week		