Northern Arizona University
College of the Environment, Forestry, and Natural Sciences
Department of Mathematics and Statistics

MAT 216 (Introduction to Matrix Algebra)
Syllabus: Fall 2025

MAT 216-001 Class 9540 MWF 8:00-8:50 in AMB 207

Instructor: Jim.Swift@NAU.edu https://nau.edu/Jim.Swift AMB 110

Office Hours: Tu W 11:30-1:00, F 1:00-3:00

If these times are inconvenient, you can make an appointment, or drop by my office any time. E-mail is always a good way to contact me. I will check my e-mail after 9:00pm on nights before a WeBWorK assignment is due, and reply that night.

Text: Schaum's Outline of Matrix Operations, vol 2, by Richard Bronson. We will cover the first 5 chapters.

Prerequisite: A grade of C or better in MAT 125 or satisfactory placement by the Department of Mathematics and Statistics.

Catalog Description: Matrix operations (addition, product, determinant, inverse, row operations); common matrix types; matrix algebra. Systems of linear equations. Vector arithmetic. Students may not earn credit for both MAT 216 and MAT 316. Letter grade only.

Course Description: MAT 216 is a 1 credit-hour class that meets the first 5 weeks of the semester. It is designed to give students an understanding of the basic concepts and structure of matrix algebra, to prepare students for courses in other disciplines that use matrix algebra, and to develop facility with matrices, vectors, and their geometric notions over $\mathbb{R}^n$, mainly for $n = 2$ and $n = 3$. This class is required for all B.S. in Data Science majors.

Student Learning Outcomes: Upon successful completion of the course, students will be able to:

1. Perform vector arithmetic, including vector addition and subtraction, vector scaling and vector dot products, and apply these to geometric situations, including components, determining orthogonality.
2. Perform calculations and operations on matrices and indicate when the operations are defined: transpose, sum, product, determinant, and inverse.
3. Represent a matrix equation, a vector equation, or a system of linear equations in any one of the other two forms. Use the matrix form and row reduction to determine the existence and uniqueness of solutions. Compute the reduced row echelon form of a given matrix. Solve a given equation or system of equations.
4. Be familiar with and understand properties of common matrix classes, including triangular matrix, diagonal matrix, the zero matrix, and the identity matrix.

5. Calculate the determinant of a square matrix. Use and understand the basic properties of determinants in calculations.

Course Structure The class will use lecture-discussion format.

Assessment of Student Learning Outcomes

Points: There will be approximately 135 possible **class points**. All class points are assigned with the scale A (90%), B (80%), C (70%), and D (60%).

When class points are assigned, they are fully "curved" and will not change further. Class points, including extra credit, are uploaded to the gradebook on Canvas. At any point, the current grade in the course is given by the percentage of the points uploaded to Canvas.

I might raise the cutoffs for the course grade from the standard 90/80/70 cutoffs, but I will not lower them.

Homework: (approximately 7 assignments, worth 3 class points each) The WeBWorK sets define the topics covered in the course. The WeBWorK assignments are typically due at 11:59pm on a night before a class.

Quizzes: (approximately 4 quizzes, worth 5 class points each) We will have a quiz on the first 4 Fridays, during class.

Final Exam: (100 class points) The Final Exam will be comprehensive, and given in class on the 5th and last Friday of the class.

Attendance: (3 possible extra credit class points) Attendance is mandatory and will be recorded at most class periods. At the end of the semester, students will receive 3 extra credit points if no absences are recorded since the previous exam. The student will receive 2 extra credit points if 1 absence is recorded. The student will receive 1 extra credit point if 2 absences are recorded. The student will receive no extra credit if 3 or more absences are recorded.

Extra credit: There are other extra credit opportunities. For example, you get up to 2 class points per week extra credit for our course from points earned in the problem of the week. Problems are graded on a scale of 1 to 4. I'll give you half that as extra credit class points (0.5 to 2 points).

Course Policies

Calculators: No calculators are allowed at the exams.

Phones/Tablets/Laptops: On non-exam days, it is suggested that you bring a mobile device for the worksheets, to take notes, do WeBWorK problems, photograph the white board, or check wikipedia pages that are relevant to the class. No social media during class, please.

Department of Mathematics & Statistics portable electronic device policy Cell phones, mp3 players and portable electronic communication devices, including but not limited to smart phones, cameras and recording devices, must be turned off and inaccessible during in-class tests. Any violation of this policy will be treated as academic dishonesty.

Excused Absences: If you have an institutional excuse, you will not lose the attendance extra credit. If you feel you deserve an excused absence for some other reason contact me by e-mail, phone, or in person. Do so before the absence, if possible. Makeup exams will be given in extenuating circumstances. Contact me *before* an exam if you must miss it.

Late Homework: I can delay your individual due date for WeBWorK assignments. I will handle requests on a case-by-case basis, but you must contact me before the due date since the answers are made available at that time.

Copyright: All course materials (printed and electronic), including handouts, tests, quizzes, and any files available on the website or CANVAS, are the intellectual property of Northern Arizona University. These materials are provided exclusively for the personal educational use of enrolled students and may not be reproduced, shared, or distributed without written permission. Warning: Uploading course materials to any website or content-sharing platform like Chegg, Course Hero, Quizlet, or any other homework-help or tutoring service, is a violation of copyright law and the academic integrity policy. Violators will be subject to formal academic misconduct charges.

Help: If you need help the first person to contact is me. I am your personal tutor at no charge. I encourage you to come to my office hours or contact me via e-mail. There is a button in WeBWorK for sending me e-mail. The Academic Success Center (ASC) has one-to-one tutoring available by appointment.

Commitment: This course is difficult and it moves quickly. You should be committed to spending an average of two hours outside of class for every class period. Regular homework and regular attendance is expected.

Generative AI and the Internet Since mathematical reasoning, problem solving, and critical thinking skills are part of the learning outcomes of this course, all assignments should be prepared by the student. Developing strong competencies in this area will prepare you for a competitive workplace. You may not submit assignments as your own work that directly copy all or a major part of the results of using ChatGPT or AI mathematics assistive technologies (e.g. Wolfram Alpha, PhotoMath, etc.). Such AI-generated submissions are not permitted and will be treated as plagiarism.

AI tools like ChatGPT may be permitted by the instructor to be used in a limited or indirect fashion for a particular type of assignment. In that case the AI tools should be used with caution and proper citation. AI is not a replacement for your own thinking and research. Over reliance on AI tools beyond that explicitly allowed is a violation of the departmental honor and ethics code. Any use of AI tools on quizzes and exams is expressly forbidden.

I suggest that you do not rely too heavily on AI and internet forums to help with the homework. Try each problem first on your own, and if you get stuck then it is OK to seek digital help. The exams do not allow the internet, so the purpose is to learn how to do these problems on your own.

Career Readiness Skills In every class you take at NAU, you learn professional skills that can support your future career. There are several ways that this course can help you meet and excel at your job goals and life desires. Below is a list of in-demand skills from National Association of Colleges and Employers (NACE) you could practice in this class:

- Communication: Demonstrate the ability to articulate mathematical concepts clearly and concisely, whether through written explanations, oral presentations, or visual representations, ensuring comprehension by peers.
- Critical Thinking: Demonstrate the ability to solve mathematical problems by considering the context in which they arise, ensuring that solutions are relevant and applicable to real-world situations.
- Professionalism: Uphold academic integrity and accountability in mathematical assignments, demonstrating honesty and ethical behavior in the completion of individual and group tasks.
- Teamwork: Collaborate actively with classmates to achieve common mathematical goals, working collectively on assignments, projects, or problem-solving exercises to enhance the overall learning experience.

Academic Honesty: Cheating on exams will not be tolerated, and procedures for reporting cheating to the university will be followed.

Do not look at other people's exams during tests. You may not use cell phones or other electronic communication devices during the exams.

You are allowed and encouraged to work together on homework. However, you are expected to complete your own work. Some quizzes allow collaboration with other students. The policy for each quiz will be clearly stated.

Suggestions: Try to do the webwork problems on your own. Keep an orderly journal with the problem number clearly indicated so you can refer to it. Do the work clearly so you can correct your mistakes. If you get stuck on a problem it is OK to look on the internet for help. But remember, there is no internet, no ChatGPT, "no nothing" allowed on tests. A sure way to fail this course is to have the internet do your webwork for you. Another way to fail the course is to skip many of the webwork assignments.

Amendments: Any changes to this syllabus will be announced in class, and the updated version will be posted on my website. This version: August 24, 2025.

NORTHERN ARIZONA UNIVERSITY
DEPARTMENT OF MATHEMATICS AND STATISTICS
SYLLABUS POLICIES – Fall 2025

Course Pre-requisites and Placement: Prior to enrollment in a course in the Department, a student must have completed the course prerequisites or have proper placement for the course. It is the student's responsibility to check that they are properly enrolled in a course and to drop the course if they are not. Failure to do so could result in the student receiving no credit for the course. The department may cancel student's registration in a course in which they are not properly enrolled. It is students' responsibility to monitor their own enrollment.

Administrative Drops: A student may be administratively dropped through the 7th business day (**September 3, 2025**) from a course by the instructor if the student meets either of the two following criteria: (1) has not met the prerequisites for the course as stated in the academic catalog, or (2) is absent one or more times from class during the first four business days of the semester.

Class Attendance: Students are expected to assume full responsibility for class attendance and are accountable for work missed because of absences. Instructors are under no obligation to make special arrangements for students who have been absent unless such absence has been excused by a formal institutional excuse. Institutional excuses permit a student to be absent from classes to represent the University in athletics and extracurricular or academic activities. Institutional excuses must be hand-delivered to the instructor and arrangements made for the work missed prior to the planned absence from class.

Adding/Dropping/Auditing a Course: The last day to add a class is **September 4, 2025**. The last day to add to a waitlist is **September 3, 2025**. The last day to drop/delete a course (*without the class appearing on your transcript*) is **September 4, 2025**. The last day to drop a course (and receive a **W**) is **December 5, 2025**. Academic policy requires that a student who never attended class or stopped attending class receive an **F** should the student fail to officially drop the course. The deadline to change from credit to audit or vice versa is **September 4, 2025**. Once a student has registered and completed a class as an auditor, the audit grade cannot be changed to a credit-earning grade. The grade of **AU** is awarded to auditors for satisfactory attendance. More information can be found at http://catalog.nau.edu/.

The Grade of Incomplete: A student, who, for reasons beyond the student's control, is unable to complete course requirements during the instructional period, may make a request to the instructor for a grade of Incomplete (**I**). The student must be passing the course and must have completed a majority of the course. Before a grade of **I** can be given the student and instructor must complete the official department form indicating the work to be completed, as well as the date(s) by which the work must be completed. All work must be completed within one year. After one year, a grade of **I** automatically reverts to a grade of **F**.

Final Examinations: Final examinations are required in all classes and must be given at the scheduled times and dates indicated in the university final exam schedule. An exception to the official final examination schedule can be made if a student is scheduled to take more than two examinations in a 24-hour period. For more information, see the schedule at https://in.nau.edu/wp-content/uploads/sites/153/2025/05/FINAL_EXAM_Sched_1257___FALL-2025-1.docx

NAU Policy Statements: Additional institutional Syllabus Policy Statements can be found at https://nau.edu/wp-content/uploads/sites/26/Syllabus-Policy-Statements_August_5_2024.pdf

Department Policy on Use of Portable Electronic Devices: Cell phones, mp3 players and portable electronic communication devices, including but not limited to smart phones, cameras, and recording devices must be turned off and inaccessible during in-class knowledge assessments. Any violation of this policy will be treated as a violation of the student academic integrity policy.

SYLLABUS POLICY STATEMENTS

ACADEMIC INTEGRITY

NAU expects every student to firmly adhere to a strong ethical code of academic integrity in all their scholarly pursuits. The primary attributes of academic integrity are honesty, trustworthiness, fairness, and responsibility. As a student, you are expected to submit original work while giving proper credit to other people's ideas or contributions. Acting with academic integrity means completing your assignments independently while truthfully acknowledging all sources of information, or collaboration with others when appropriate. When you submit your work, you are implicitly declaring that the work is your own. Academic integrity is expected not only during formal coursework, but in all your relationships or interactions that are connected to the educational enterprise. All forms of academic deceit such as plagiarism, cheating, collusion, falsification or fabrication of results or records, permitting your work to be submitted by another, or inappropriately recycling your own work from one class to another, constitute academic misconduct that may result in serious disciplinary consequences. All students and faculty members are responsible for reporting suspected instances of academic misconduct. All students are encouraged to complete the online course entitled **Academic Integrity @NAU for Students** found in their Canvas Dashboard and review the full NAU Academic Integrity Policy.

ARTIFICIAL INTELLIGENCE

Artificial intelligence (AI) technologies bring both opportunities and challenges. Ensuring honesty in academic work creates a culture of integrity and expectations of ethical behavior. The use of these technologies can depend on the instructional setting, varying by faculty member, program, course, and assignment. Please refer to course policies, any additional course-specific guidelines in the syllabus, or communicate with the instructor to understand expectations. NAU recognizes the role that these technologies will play in the current and future careers of our graduates and expects students to practice responsible and ethical use of AI technologies to assist with learning within the confines of course policies.

COPYRIGHT INFRINGEMENT

All lectures and course materials, including but not limited to exams, quizzes, study outlines, and similar materials are protected by copyright. These materials may not be shared, uploaded, distributed, reproduced, or publicly displayed without the express written permission of NAU. Sharing materials on websites such as Course Hero, Chegg, or related websites is considered copyright infringement subject to United States Copyright Law and a violation of NAU Student Code of Conduct. For more information on ABOR policies relating to course materials, please refer to ABOR Policy 6-908 A(2)(5).

COURSE TIME COMMITMENT

Pursuant to Arizona Board of Regents guidance (ABOR Policy 2-224, *Academic Credit*), each unit of credit requires a minimum of 45 hours of work by students, including but not limited to, class time, preparation, homework, and studying. For example, for a 3-credit course a student should expect to work at least 8.5 hours each week in a 16-week session and a minimum of 33 hours per week for a 3-credit course in a 4-week session.

DISRUPTIVE BEHAVIOR

Membership in NAU's academic community entails a special obligation to maintain class environments that are conductive to learning, whether instruction is taking place in the classroom, a laboratory or clinical setting, during course-related fieldwork, or online. Students have the obligation to engage in the educational process in a manner that does not interfere with normal class activities or violate the rights of others. For more information, see the Student Code of Conduct policy.

NONDISCRIMINATION AND ANTI-HARASSMENT

NAU prohibits discrimination and harassment based on sex, gender, gender identity, race, color, age, national origin, religion, sexual orientation, disability, veteran status and genetic information. Certain consensual amorous or sexual relationships between faculty and students are also prohibited as set forth in the *Consensual Romantic and Sexual Relationships* policy. The Equity and Access Office (EAO) responds to complaints regarding discrimination and harassment that fall under NAU's *Nondiscrimination and Anti- Harassment* policy. To report a concern related to possible

unlawful discrimination or harassment or to request a time to meet, please use the Report an Issue Form. To file a complaint, please submit the online Complaint Form. EAO also assists with religious accommodations. To request a religious accommodation, please use the Religious Accommodation Request Intake Form. EAO additionally provides access to lactation spaces, and please use to the Lactation Space Request Form to request use of a location. For additional information about nondiscrimination or anti-harassment, contact EAO at EquityandAccess@nau.edu, or visit the EAO website at https://nau.edu/equity-and-access. The EAO is located in Old Main on the first floor.

TITLE IX

Title IX of the Education Amendments of 1972, as amended, protects individuals from discrimination based on sex in any educational program or activity operated by recipients of federal financial assistance. In accordance with Title IX, Northern Arizona University prohibits discrimination based on sex or gender in all its programs or activities. Sex discrimination includes sexual harassment, sexual assault, relationship violence, and stalking. NAU does not discriminate on the basis of sex in the education programs or activities that it operates, including in admission and employment. NAU is committed to providing an environment free from discrimination based on sex or gender and provides a number of supportive measures that assist students, faculty and staff employees, and covered guests.

One may direct inquiries concerning the application of Title IX to either or both the university Title IX Coordinator or the U.S. Department of Education, Assistant Secretary, Office of Civil Rights. You may contact NAU's Title IX Coordinator at titleix@nau.edu or by phone at 928-523-5434. In furtherance of its Title IX obligations, NAU promptly will investigate or equitably resolve all reports of sex/gender-based discrimination, harassment, or sexual misconduct and will eliminate any hostile environment as defined by law. To submit a report, please use the File a Report Form. The Office for the Resolution of Sexual Misconduct (ORSM): Title IX Institutional Compliance, Prevention & Response addresses matters that fall under the university's Sexual Misconduct Policy. ORSM also facilitates reasonable modifications for pregnant or parenting individuals. Additional important information and related resources, including how to request help or confidential support following conduct covered by the Sexual Misconduct Policy, is available on the ORSM web site, and you also may contact the office at titleix@nau.edu. The ORSM is located in Gammage on the third floor.

ACCESSIBILITY

Professional disability specialists are available at Disability Resources to facilitate a range of academic support services and accommodations for students with disabilities. If you have a documented disability, you can request assistance by contacting Disability Resources at 928-523-8773 (voice), 928-523-8747 (fax), or dr@nau.edu (e-mail). Once eligibility has been determined, students register with Disability Resources every semester to activate their approved accommodations. Although a student may request an accommodation at any time, it is best to initiate the application process at least four weeks before a student wishes to receive an accommodation. Students may begin the accommodation process by submitting a self-identification form online or by contacting Disability Resources. The Director of Disability Resources, Jamie Axelrod, serves as NAU's Americans with Disabilities Act Coordinator and Section 504 Compliance Officer. He can be reached at jamie.axelrod@nau.edu

RESPONSIBLE CONDUCT OF RESEARCH

Students who engage in research at NAU must receive appropriate Responsible Conduct of Research (RCR) training. This instruction is designed to help ensure proper awareness and application of well-established professional norms and ethical principles related to the performance of all scientific research activities. For more information and details, students are encouraged to navigate to the complete policy on Responsible Conduct of Research Training.

MISCONDUCT IN RESEARCH

As noted, NAU expects every student to firmly adhere to a strong code of academic integrity in all their scholarly pursuits. This includes avoiding fabrication, falsification, or plagiarism when conducting research or reporting research results. Engaging in research misconduct may result in serious disciplinary consequences. Students must also report any suspected or actual instances of research misconduct of which they become aware. Allegations of research misconduct should be reported to your instructor or the University's Research Integrity Officer, Scott Pryor, who can be reached at scott.pryor@nau.edu or 928-523-5927. Students are encouraged to view the complete policy on Misconduct in Research.

SENSITIVE COURSE MATERIALS

University education aims to expand student understanding and awareness. Thus, it necessarily involves engagement with a wide range of information, ideas, and creative representations. In their college studies, students can expect to encounter and to critically appraise materials that may differ from and perhaps challenge familiar understandings, ideas, and beliefs. Students are encouraged to discuss these matters with faculty.

Last revised August 14, 2025