

**Penn State University - University Park**  
**MATH 220, Matrices**  
**Fall 2016**

**CATALOG DESCRIPTION:** **MATH 220** (GQ) MATRICES (2 semester hours) Systems of linear equations; matrix algebra; eigenvalues and eigenvectors; linear systems of differential equations

**PREREQUISITE:** MATH 110, MATH 140 or MATH 140H

**TEXT:** MyMathLab Student Access Kit, ISBN-13: 978-0-321-19991-1

**COURSE FORMAT:** There are two 50-minute lectures each week. The sections covered in lectures are listed at the end of this syllabus.

**CALCULATORS:** A graphing calculator is useful as a study and learning tool when used appropriately, but it is not essential. Matrices is a collection of ideas that is not mastered through calculator skills. **No calculators** are allowed on quizzes, midterms, or on the final examination.

**TUTORS AND MATH CENTER:** Free mathematics tutoring is available at Penn State Learning located in 7 Sparks. For more information, go to the [Penn State Learning](#) webpage.

**EXAMINATIONS:** One 75-minute evening midterm examination will be given during the semester and a comprehensive final examination will be given during the final examination period. NO books, notes, or calculators may be used on the examinations. You must bring your University ID card to all exams. The midterm examination will be given from **6:30–7:45 PM** on the following date:

<b>Midterm Examination</b>	Wednesday, October 12
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Rooms for examinations will be announced by your instructor at a later date and may also be found on the department's [Courses](#) website when they are available. It is not permissible to take the exam in a different instructor's assigned room.

**CONFLICT / MAKEUP EXAM POLICY:** In addition to the regularly scheduled midterm examination, the Mathematics Department schedules two additional options: a conflict exam for the midterm from 5:05–6:20 on the same night as the regularly scheduled exam and a makeup exam scheduled on an evening different from that of the regularly scheduled exam. Students who attend the conflict exam will not be permitted to leave before 6:25. Sign-up sheets for both the conflict exam and the makeup exam will be distributed by your instructor during class. If you need to schedule the conflict exam, you must sign up **at least one full week** ahead of the scheduled exam date. A valid conflict/makeup reason is required to sign up for either of these exams. It is the student's responsibility to sign up and to note the time and location of the makeup or conflict exam; that information is on the sign-up sheet. **It is the student's responsibility to sign up on the appropriate sheet.**

**NOTE:** If you miss an exam without an official excuse (such as illness or official university business), you *may* be allowed to take a makeup exam, but with an automatic 20% deduction from the grade. To avoid this deduction, you must notify your instructor with your official excuse, before the date and time of the exam. This notification may be performed in person, via e-mail, or by telephone.

**Who may take the Conflict Exam?** If you have a valid conflict with the regular examination time, such as a class or another official university activity, you may sign up for the conflict exam. If a student has not signed up for the conflict exam, he or she will not be permitted to take the exam.

**Instructions on Conflict Exam night** The student is responsible for knowing the room and time of the conflict examination. **Each student must bring his or her University ID to the conflict examination.** The ID will be

checked by the proctor. **Although the conflict examination will end at 6:20 PM, no student will be permitted to leave the examination room before 6:25 PM.**

**Who may take the Makeup Exam?** Students who have a valid documented reason, such as a class conflict or illness, during both the conflict and regular examination times are permitted to schedule a makeup examination with no penalty. You must be prepared to verify the reason for taking the makeup. **Personal business, such as travel, employment, weddings, graduations, or attendance at public events such as concerts, sporting events, and Greek Rush events, is not a valid excuse. Forgetting the date, time or room of an examination is not a valid excuse.** Students who do not have a valid reason for missing the examination are permitted to schedule the makeup, but 20 points will be deducted from their score. Students who have taken either the regularly scheduled examination or conflict examination are not permitted to take the makeup examination. The date and time of the makeup examination will be announced by your instructor after class begins.

**How and when to sign up for the Makeup Exam** A student who is ill on exam night must contact his or her instructor within 24 hours of the exam. Students must sign up for the Makeup Exam in class on a yellow form, as soon as possible following the regular exam date. The student is responsible for knowing the room and time of the makeup examination. This information is on the yellow form. Instructors must turn in the yellow form **3 class days** prior to the examination date. If a student has not signed up with his or her instructor, the student will not be allowed to take the makeup exam.

**Instructions on Makeup Exam night** The student is responsible for knowing the room and time of the makeup examination. **Each student must bring his or her PSU ID to the makeup examination.** The ID will be checked by the proctor.

**What if a student misses both the regularly scheduled exam and the makeup exam?** If a student misses both the regularly scheduled examination and the scheduled makeup due to a valid, verifiable reason, it may be possible to take a makeup examination by appointment. All such makeup examinations must be scheduled through the classroom instructor with the approval of the course coordinator and must be completed no later than one week after the scheduled makeup examination.

**FINAL EXAMINATION:** The final examination will be given during the week, December 12-16, 2016. **The final examination may be scheduled by the university's Registrar's Office on any day during the final examination period. Do not plan to leave University Park until after Friday, December 16, 2016.** Notification of conflicts is given on the student's final exam schedule. There are two types of conflict examinations: direct and overload. Direct conflicts are two examinations scheduled at the same time. Overload examinations are three or more examinations scheduled within a fifteen hour period, from the beginning of the first examination to the beginning of the third examination. Students may elect to take the three or more examinations on the same day if they wish or request a conflict final examination. **A student must take action to request a conflict exam electronically between September 26 and October 16, 2016. Conflict final examinations cannot be scheduled through the Mathematics Department, and there will be no sign up sheet in class for the final conflict examination.** Students who miss or cannot take the final examination due to a valid and documented reason, such as illness, may be allowed to take a makeup final examination at the beginning of the next semester. **Personal business, such as travel, employment, weddings, graduations, or attendance at public events such, as concerts and sporting events are not valid excuses. Forgetting the date, time, or room of an examination is not a valid excuse.** If the student does not have a valid reason, a 25% penalty will be imposed. All such makeup examinations must be arranged through the instructor with the approval of the course coordinator, and students in such a situation should contact their instructor within 24 hours of the scheduled final examination. Students who have taken the original final examination are not permitted to take a makeup examination.

**COURSE GRADES:** Grades will be assigned on the basis of 350 points, distributed as follows:

Midterm Examination	100 POINTS
Homework and/or Quizzes	100 POINTS
Final Examination	150 POINTS
Total	350 POINTS

Final course grades will be assigned as follows:

Grade	Raw Score	Percent Score
A	324-350 POINTS	93% - 100%
A-	314-323 POINTS	90%-92%
B+	303-313 POINTS	87%-89%
B	289-302 POINTS	83%-86%
B-	279-288 POINTS	80%-82%
C+	268-278 POINTS	77%-79%
C	244-267 POINTS	70%-76%
D	209-243 POINTS	60%-69%
F	000-208 POINTS	0%-59%

**NOTE:** Your grade will be based **EXCLUSIVELY** on the midterm examination, homework and/or quizzes, and the final examination. **There is no "extra credit" work.**

**DEFERRED GRADES:** Students who are unable to complete the course because of illness or emergency may be granted a deferred grade which will allow the student to complete the course within ten weeks following the end date of the course (as it appears in the [Schedule of Courses](#)). Note that deferred grades are limited to those students who can verify and document a valid reason for not being able to take the final examination. For more information see [DF grade](#).

**LATE-DROP:** Students may add/drop a course without academic penalty within the first ten calendar days of the semester. A student may late drop a course within the first twelve weeks of the semester. The late drop deadline for Fall 2016 is **November 11, 2016**.

**ACADEMIC INTEGRITY:** Academic dishonesty is not limited to simply cheating on an exam or assignment. The following is quoted directly from the "PSU Faculty Senate Policies for Students" regarding academic integrity and academic dishonesty: "Academic integrity is the pursuit of scholarly activity free from fraud and deception and is an educational objective of this institution. Academic dishonesty includes, but is not limited to, cheating, plagiarizing, fabricating of information or citations, facilitating acts of academic dishonesty by others, having unauthorized possession of examinations, submitting work of another person or work previously used without informing the instructor, or tampering with the academic work of other students." All University and Eberly College of Science policies regarding academic integrity/academic dishonesty apply to this course and the students enrolled in this course. Refer to the following URL for further details on the academic integrity policies of the Eberly College of Science: <http://www.science.psu.edu/academic/Integrity/index.html>. Each student in this course is expected to work entirely on her/his own while taking any exam, to complete assignments on her/his own effort without the assistance of others unless directed otherwise by the instructor, and to abide by University and Eberly College of Science policies about academic integrity and academic dishonesty. Academic dishonesty can result in assignment of "F" by the course instructors or "XF" by Judicial Affairs as the final grade for the student.

**STUDENTS WITH DISABILITIES:** Penn State welcomes students with disabilities into the University's educational programs. Every Penn State campus has an office for students with disabilities. The Office for Disability Services (ODS) Web site provides contact information for every Penn State campus: <http://equity.psu.edu/ods/dcl>. For further information, please visit the Office for Disability Services Web site: <http://equity.psu.edu/ods>.

In order to receive consideration for reasonable accommodations, you must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: <http://equity.psu.edu/ods/doc-guidelines>. If the documentation supports your request for reasonable accommodations, your campus's 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.

**QUESTIONS, PROBLEMS, OR COMMENTS:** If you have questions or concerns about the course, please consult your instructor first. If further guidance is needed, you may contact the course coordinator whose contact information is given below.

**Course Coordinator**

Dr. James Sellers, Professor and Director of Undergraduate Mathematics

104 McAllister Building

Telephone: 814-865-7528

E-mail: [sellersj@psu.edu](mailto:sellersj@psu.edu)

Please include your name, student ID number, course, and section number in any correspondence.

## SUGGESTED LECTURE SCHEDULE

WEEK	DAY	DATE	SECTION(S)	TOPIC
1	Tuesday	Aug 23	1.1	Systems of Linear Equations
	Thursday	Aug 25	1.1, 1.2	Systems of Linear Equations, Row Reduction and Echelon Forms
2	Tuesday	Aug 30	1.2	Row Reduction and Echelon Forms
	Thursday	Sept 1	1.3	Vector Equations
3	Tuesday	Sept 6	1.3, 1.4	Vector Equations, The Matrix Equation $A\mathbf{x}=\mathbf{b}$
	Thursday	Sept 8	1.5	Solution Sets of Linear Systems
4	Tuesday	Sept 13	1.7	Linear Independence
	Thursday	Sept 15	1.8	Introduction to Linear Transformations
5	Tuesday	Sept 20	1.9	The Matrix of a Linear Transformation
	Thursday	Sept 22	2.1	Matrix Operations
6	Tuesday	Sept 27	2.2	The Inverse of a Matrix
	Thursday	Sept 29	2.3	Characterizations of Invertible Matrices
7	Tuesday	Oct 4	2.8	Subspaces of $\mathbb{R}^n$
	Thursday	Oct 6	2.8, 2.9	Subspaces of $\mathbb{R}^n$ , Dimensions and Rank
8	Tuesday	Oct 11		<b>Review for midterm</b>
	Thursday	Oct 13	2.9	Dimensions and Rank
9	Tuesday	Oct 18	3.1	Introduction to Determinants
	Thursday	Oct 20	3.2, 3.3	Properties of Determinants, Cramer's Rule
10	Tuesday	Oct 25	5.1	Eigenvalues and Eigenvectors
	Thursday	Oct 27	5.1	Eigenvalues and Eigenvectors

11	Tuesday	Nov 1	5.2	The Characteristic Equation
	Thursday	Nov 3	5.3	Diagonalization
12	Tuesday	Nov 8	6.1	Inner Product, Length and Orthogonality
	Thursday	Nov 10	6.2	Orthogonal Sets
13	Tuesday	Nov 15	6.3	Orthogonal Projections
	Thursday	Nov 17	6.4	The Gram-Schmidt Process
14	Tuesday	Nov 29	7.1	Diagonalization of Symmetric Matrices
	Thursday	Dec 1	7.1	Diagonalization of Symmetric Matrices
15	Tuesday	Dec 6		<b>Review for final examination</b>
	Thursday	Dec 8		<b>Review for final examination</b>