MATH 220
Matrices
Sample Syllabus

Description

Systems of linear equations, matrix algebra, eigenvalues and eigenvectors, orthogonality and least squares, symmetric matrices, and quadratic forms.

Prerequisite

Math 110 or Math 140

Objectives

Upon successful completion of Math 220, the student should be able to:

- Know what is meant by a system of linear equations (or linear system) and its solution set
- Know how to write down the coefficient matrix and augmented matrix of a linear system
- Use elementary row operations to reduce matrices to echelon forms
- Make use of echelon forms in finding the solution sets of linear systems
- Know how to manipulate with vectors in Euclidean space
- Understand the meaning of linear independence/dependence and span
- Interpret linear systems as vector equations
- Define matrix-vector product and be able to interpret linear systems as matrix equations
- Write the general solution of linear systems in parametric vector form
- Understand the relation between the solution set of a consistent inhomogeneous linear system and its associated homogeneous equation
- Determine whether sets of vectors are linearly independent or dependent
- Know what is meant by a linear transformation between Euclidean spaces
- Determine the standard matrix of a linear transformation
- Give the geometric description of some matrices
- Understand the notion of one-to-one mapping and onto mapping
- Know how to scale a matrix, take the transpose of a matrix, and how to add and multiply matrices
- Know what is meant by an invertible matrix
- Know how to compute the inverse of a matrix, if it exists
- Understand the various characterizations of an invertible matrix
- Determine if a given subset of a Euclidean space is a subspace
- Know what is the column space and nullspace of a matrix and how to determine these spaces
- Find a basis of a subspace of a Euclidean space
- Define the concept of dimension and how to use the rank plus nullity theorem
- Know the recursive definition of determinants
- Make use of the properties of determinants in their calculations
- Find eigenvalues and eigenvectors of square matrices
- Diagonalize square matrices, whenever possible
- Compute the inner product of vectors, lengths of vectors, and determine if vectors are orthogonal

- Know what is meant by an orthogonal set, orthogonal basis and orthogonal matrix
- Find the orthogonal projection of a vector onto a subspace
- Find an orthogonal basis using the Gram-Schmidt process
- Orthogonally diagonalize symmetric matrices

Textbook

Students are required to buy one of the two materials listed.

- MyMathLab - Access Code, ISBN 9780321199911. This includes eBook access to Linear Algebra and Its Applications, 5th edition
- Linear Algebra and Its Applications (Printed loose-leaf text), ISBN 9780321989925. This includes MyMathLab Access Code.

Course Format

This course is taught completely online. We'll use Penn State's course management system CANVAS. You do not need to come to campus at any time. An online course is not easier than on-campus course. In fact, it takes a lot more self-discipline. You must be willing and able to commit the same amount of time as you would for attending class and studying for a traditional course. You must also be a motivated, organized student who is comfortable working independently.

Recorded Lectures

Recorded lectures on each of the topics covered in the course are available. Copies of the slides from the recorded lectures are also available so that students may write solutions to the problems as they watch the lectures. Filled in copies of the slides are also available.

Electronic Textbook

The electronic text will be primarily used to tie ideas to concepts and skills together. The text will be used to provide the student additional detail and examples.

Online Homework, Quizzes & Projects

Online homework and quizzes will be due on a weekly basis. Four application projects will be due at the times specified on the course outline.

Final Exam (Proctored)

A proctored final exam is included in the course. No notes or calculators will be allowed to be used on the final exam.

Grading

Grades will be assigned on the basis of 500 points, distributed as follows:

Assignment	Points
Homework (11/12 counted for 6pts each)	66
Quizzes (11/12 counted for 4pts each)	44
Applied Problem Sets / Projects (4 counted for 10pts each)	40
Midterm Exam 1	100
Midterm Exam 2	100
Proctored Final Exam (No notes / Calculators)	150
Total	500

Grading Scale

Letter Grade	% Score
A	93-100%
A-	90-92%
B+	87-89%
B	83-86%
B-	80-82%
C+	77-79%
C	70-76%
D	60-69%
F	0-59%

Examity

In this class you may take your tests remotely and they will be proctored by a service called Examity®. Please log in as soon as possible to set up your profile. You will not be able to schedule exams until your profile is complete. Examity® system requirements are:

- Desktop computer or laptop (tablets, Chromebook and cell phones do not meet our requirements).
- Webcam and microphone (built-in or external).
- Connection to network with sufficient internet speed: at least 2 Mbps download speed and 2 Mbps upload.
- Operating systems: Windows XP–Windows 10, Mac OS X 10.8 (Mountain Lion)–10.11 (El Capitan).
- Browser with pop-up blocker disabled: Google Chrome v39 or later, Mozilla Firefox v34 or later, Internet Explorer v8 or later, Microsoft Edge, Apple Safari v6 or later.

After you create your Examity profile, you will have the option to schedule proctoring times for each of your exams. On the day of your exam, go to your Examity dashboard using the single sign-on link and select the 'Start Exam' button to meet the proctor.

Examity Proctors

Examity's proctors are highly-trained individuals who go through a rigorous process of selection, including background checks and comprehensive training. All proctors have a college degree, advanced technical and communication skills, and have completed online courses.

Proctoring Terms of Service

This course may require you to take exams using certain proctoring software that uses your computer's webcam or other technology to monitor and/or record your activity during exams. The proctoring software may be listening to you, monitoring your computer screen, viewing you and your surroundings, recording and storing any and all activity (including visual and audio recordings) during the proctoring process. By enrolling in this course, you consent to the use of the proctoring software selected by your instructor, including but not limited to any audio and/or visual monitoring which may be recorded. Please contact your instructor with any questions.

This information is provided by Penn State World Campus

If you have any technical questions or concerns, contact Examity's support team 24/7 via email or phone at (855) 392-6489.

Academic Integrity

Academic integrity is the pursuit of scholarly activity in an open, honest and responsible manner. Academic integrity is a basic guiding principle for all academic activity at The Pennsylvania State University, and all members of the University community are expected to act in accordance with this principle. Consistent with this expectation, the University's Code of Conduct states that all students should act with personal integrity, respect other students' dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts.

Academic integrity includes a commitment by all members of the University community not to engage in or tolerate acts of falsification, misrepresentation or deception. Such acts of dishonesty violate the fundamental ethical principles of the University community and compromise the worth of work completed by others.

Accommodating 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 Student Disability Resources (SDR) website provides contact information for every Penn State campus . For further information, please visit Student Disability Resources website.

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: See documentation guidelines . If the documentation supports your request for reasonable accommodations, your campus 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 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, crisis intervention, consultations, online chats, and mental health screenings. 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.

- Counseling and Psychological Services at University Park (CAPS): 814-863-0395
- Counseling and Psychological Services at Commonwealth Campuses
- Penn State Crisis Line (Available 24 hrs, 7 days a week): 877-229-6400
- Crisis Text Line (Available 24 hrs, 7 days a week): Text LIONS to 741741

Educational Equity / Report Bias

Penn State takes great pride to foster a diverse and inclusive environment for students, faculty, and staff. Acts of intolerance, discrimination, or harassment due to age, ancestry, color, disability, gender, gender identity, national origin, race, religious belief, sexual orientation, or veteran status are not tolerated and can be reported through Educational Equity via the Report Bias website.