Math 207 B Matrices and Linear Algebra (F 2015)

Webpage: [http://orion.math.iastate.edu/lhogben/math207.html](http://orion.math.iastate.edu/lhogben/math207.html)


Credits: 3
Prerequisites: 2 semesters of calculus
Description: Systems of linear equations, determinants, vector spaces, linear transformations, orthogonality, least-squares methods, eigenvalues and eigenvectors. Emphasis on methods and techniques.

Instructor Information
Prof. Leslie Hogben
Email: LHogben@iastate.edu (please put math 207 in subject header)
Office: 488 Carver
Telephone: 294-8168 (do not leave messages, use e-mail instead)
Personal Office Hours: W 9-10A (tentative)
(OH begin Aug. 31 and end Dec. 12; final week OH schedule is different)

Math 207 Help
There are about 15 hours a week of Math 207 help/office hours in various locations. See links below for schedule. (OH begin Aug. 31 and end Dec. 12)
[http://www.math.iastate.edu/Directories/CourseGroupOfficeHours.html](http://www.math.iastate.edu/Directories/CourseGroupOfficeHours.html) (select 207) or
[https://docs.google.com/spreadsheets/d/1tptMgp-fNpIDzQXDe4yMeA1VH_v9ynDJBr1UG9xds/pubhtml?gid=1372503713&single=true](https://docs.google.com/spreadsheets/d/1tptMgp-fNpIDzQXDe4yMeA1VH_v9ynDJBr1UG9xds/pubhtml?gid=1372503713&single=true)

Content covered and order of topics
Applications will be interspersed throughout the semester.
Chapter 1: 1.1, 1.2
Chapter 2: 2.1-2.4
Chapter 3: 3.1-3.3
Chapter 4: 4.1-4.7
Chapter 5: 5.1-5.4
Chapter 7: 7.1-7.3 (omit linear transformation parts)
Chapter 6: 6.1-6.4 and (linear transformation parts of 7.1-7.2)
Chapter and Section references are to the text,
*Elementary Linear Algebra* 7th ed. by Ron Larson

Learning Outcomes: (adapted from Math 207 Department page) The following are the aspects of linear algebra that all students should be able to demonstrate.
• Understand the uses of echelon form and row reduced echelon form in solving systems of linear equations.
• Understand the concepts of linear independence and span.
• Understand the mechanics of finding an orthonormal basis.
• Understand the mechanics of finding (real) eigenvectors and eigenvalues and their use in diagonalizing matrices.
• Interpret matrices as representations of linear transformations.

**Learning Objectives** (adapted from Math 207 Department page)

**Systems of Linear Equations**
- Recognize and set up a system of linear equations
- Perform row operations on a system of linear equations to obtain echelon and reduced echelon forms
- Interpret echelon forms to determine solution sets of systems of linear equations
- Apply systems of linear equations to problems in networking, balancing chemical equations, and other areas

**Matrix Algebra and Determinants**
- Perform matrix arithmetic operations
- Use determinants do determine if a matrix is invertible
- Use determinants to find the inverse of a matrix if it exists
- Apply augmented matrices to find the inverse of a matrix if it exists

**Vector Spaces**
- Verify whether a subset is a subspace of an $n$ dimensional real space
- Verify whether a subset of an abstract vector space is a subspace
- Produce a basis for a given vector space
- Verify if a given set is linearly independent, spanning, or both
- Identify the standard subspaces $\ker A$, $\Col A$, and $\Row A$ for a given matrix $A$

**Inner Product Spaces**
- Understand orthogonality and magnitude in $n$ dimensional space
- Utilize inner products in abstract vector spaces
- Use an inner product to induce a norm
- Utilize matrices to solve least squares problems

**Eigenvalues and Eigenvectors**
- Understand the definition of eigenvalues and eigenvectors
- Verify if given scalars are eigenvalues
- Verify if given vectors are eigenvectors
- Use the characteristic polynomial to find all eigenvalues and eigenvectors
- Use the number of eigenvectors to determine if a matrix is diagonalizable

**Linear Transformations**
- Find the standard matrix for a given linear transformation
- Interpret matrix multiplication as a composition of linear transformations
- Find change of base matrices and their relationship to a linear transformation
- Relate one to one and onto with $\ker A$ and $\Col A$ and invertibility

**Assessment**
- 2 one hour examinations: 20% each
- Final examination: 40%
- Homework: 20%
First exam about Oct. 10, second exam about Dec. 4. See website for actual examination dates.

Your grade will not be worse than that obtained from a 90, 80, 70, 60 scale applied to the above total, and may be better. There is no curve in the traditional sense, in that you are not competing against each other, but against an objective standard- the goal is to have everyone succeed.

**Homework** is done on WebAssign, which can be accessed from Blackboard. Each assignment is due at noon two days after the day it is assigned, and the assignment can no longer be submitted at noon four days after the day is assigned. There will be homework assignments due in Dead Week.

**Attendance** It is your responsibility to attend all classes. Although attendance is not formally part of the grade, there is a high correlation between missing classes and failing the course.

**Electronic devices** All ringers must be off during class and the use of all electronic devices during class is discouraged. Recording and/or photographing lectures without permission is prohibited. The use of electronic devices during examinations is prohibited.

This class adheres to Mathematics Department and University policies. See [http://www.math.iastate.edu/Faculty/ClassPolicies.html](http://www.math.iastate.edu/Faculty/ClassPolicies.html)

Make-up examination policies, disability accommodation policies, academic misconduct polices, etc. are discussed there.

See also:

Math 207 B homepage [http://orion.math.iastate.edu/lhogben/math207.html](http://orion.math.iastate.edu/lhogben/math207.html)

Math 207 Department page (all sections) [http://orion.math.iastate.edu/dept/CoursePages/207/](http://orion.math.iastate.edu/dept/CoursePages/207/)

If changes are necessary, an updated version will be posted on the course website, announced in class, and announced via email.