MATH 441-T01
Applied Linear Algebra
Fall Semester 2013

Catalog: MATH 441 Applied Linear Algebra (3-0) Credit 3. Matrices; algebra of matrices; determinants; vector spaces; linear transformations; inner product spaces; eigenvalues and eigenvectors; applications. Prerequisite: MATH 251.

Objective: This course is designed to provide an introduction to the concepts and theory of Linear Algebra and the applications that are frequently used in Advanced Engineering, Computer Science and Mathematics courses.

Outcomes: Upon completion of this course, the students will be able to:

1. Solve system of linear equations by various methods.
2. Perform the matrix operations.
3. Evaluate determinants by expansion and elementary operations.
4. Understand the basic properties of matrices and determinants.
5. Know and use the concepts of vector space, subspace, linear combination, linear independence, basis and dimension of vector space.
6. Know and use the concepts of inner product, norm, distance, and orthogonality in inner product scales.
7. Understand the concept and basic properties of linear transformation.
8. Find the kernel, range and matrix representation of a linear transformation.
9. Find the eigenvalues, eigenvectors and eigenspaces of a square matrix.
10. Understand the concepts of and process of diagonalization and orthogonal diagonalization of matrices.
11. Apply the theories to various practical problems.

Instructor: Susan Barton, Ph.D., Professor of Mathematics
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Office/Phone: Engineering Lab Building 101H / 304-442-3297
Office Hours: R 9-11; MWF 12-1; MW 2-3; I'm in the Math Lab T 9-11
Class: MWF 8:00-8:50 Elab 205
Method: This is a lecture based course meeting 3 times a week.
Resources: A course calendar etc. may be found at community.wvu.edu/~smb031

Textbook: Roland E. Larson and Bruce H. Edwards, *Elementary Linear Algebra,* Sixth Edition, Houghton Mifflin Company, 2009.

Chapters Covered:

Chapter 1, sections 1,2,3 (part)
Chapter 2, sections 1,2,3,4,5 (part)
Chapter 3, sections 1,2,3,4,5
Chapter 4, sections 1,2,3,4,5,6,7
Chapter 5, sections 1,2,3 (time permitting)
Chapter 6, sections 1,2,3,4
Chapter 7, sections 1,2,3,4 (part)

Topics:

1. System of Linear Equations (5 days)
   a) Introduction to System of Linear Equations
   b) Gauss Elimination and Gauss-Jordan Elimination
   c) Applications of System of Linear Equations
2. Matrices (4 days)
   a) Operations with Matrices
   b) Properties of Matrix Operations
   c) The Inverse of a Matrix
   d) Elementary Matrices
   e) Applications of Matrix Operations
3. Determinants (4 days)
   a) The Determinant of a Matrix
   b) Evaluation of Determinants Using Elementary Operations
   c) Properties of Determinants
   d) Applications of Determinants
4. Vector Spaces (11 days)
   a) Vector Spaces
   b) Subspaces of Vector Independence
   c) Spanning Set and Linear Independence
   d) Basis and Dimension
   e) Rank of a Matrix and System of Linear Equations
   f) Coordinates and Change of Basis
5. Inner Product Spaces (5 days)
   a) Inner Product Spaces
   b) Orthonormal Basis and Gram-Schmidt Process
   c) Applications of Inner Product Spaces
6. Linear Transformations (6 days)
   a) Linear Transformations
   b) Kernel and Range of a Linear Transformation
   c) Matrix Representations for Linear Transformations
   d) Transition Matrix and Similarity
7. Eigenvalues and Eigenvectors (6 days)
   a) Eigenvalues and Eigenvectors
   b) Diagonalization and Orthogonal Diagonalization
   c) Applications of Eigenvalues and Eigenvectors

Grading and Assessment:

Quizzes/Homework: There will be at 3 quizzes for 25 points apiece (total about 11% of your grade). In addition homework will be assigned. Your total homework grade will be scaled to 75 points at the end of the semester (about 11% of your grade).

Attendance: One point will be assigned for every day that you are in the room when attendance is taken AND you do not use your cell phone or other distracting device in class. This is a participation point and may be taken away at the instructor's discretion. The result will be scaled to 50 points of your course grade. (about 7% of your grade)

Exams: Three in class hourly tests, each worth 100 points (about 14% of your course grade).

Final Exam: A comprehensive final worth 200 points (about 28% of your grade) will be given.
NOTE: Only excused absences will enable a student to make up exams. This means that you must have an excuse for the day of the missed exam and every subsequent day until you have made it up. In general quizzes may not be made-up. I will accept late homework up until the time I pass out the solutions, with a penalty of 10% for every day it is late.
Course Grade: Grades are assigned according to the following scale:

A – 90% - 100%	(630 – 700 points)
B – 80% -	(560 – 629 points)
C – 70% -	(490 – 559 points)
D – 60% -	(420 – 489 points)
F - below 60%	

Borderline grades may be improved based on performance and grade distribution of the whole class.

Calculator Usage: Graphing calculators will be forbidden on most exams and quizzes. No phones may be used as calculators on exams or quizzes.

Computer Usage: None **Reference:** None **Laboratory Projects:** None

ABET Category Content: Mathematics - Credit 3 or 100%

Disclaimer: The professor reserves the right to make any necessary adjustments and/or modifications to this syllabus.

Academic Integrity:
The integrity of the classes offered by any academic institution solidifies the foundation of its mission and cannot be sacrificed to expediency, ignorance, or blatant fraud. Therefore, I will enforce rigorous standards of academic integrity in all aspects and assignments of this course. For the detailed policy of West Virginia University regarding the definitions of acts considered to fall under academic dishonesty and possible ensuing sanctions, please see the Student Conduct Code http://studentlife.wvu.edu/office_of_student_conduct/student_conduct_code. Should you have any questions about possibly improper research citations or references, or any other activity that may be interpreted as an attempt at academic dishonesty, please see me *before* the assignment is due to discuss the matter.

Inclusivity:
"The West Virginia University community is committed to creating and fostering a positive learning and working environment based on open communication, mutual respect, and inclusion. If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class, please advise me and make appropriate arrangements with the Office of Disability Services (293-6700). For more information on West Virginia University's Diversity, Equity, and Inclusion initiatives, please see http://diversity.wvu.edu."

TENTATIVE Calendar

19 1.1	21 1.1	23 1.2
26 1.2/1.3	28 2.1	30 2.2 (Quiz 1)
2-Sep 	4 2.3	6 2.4
9 2.5 (part)	11 3.1	13 3.2
16 3.3	18 Review	20 Exam I
23 3.4/3.5	25 3.5	27 4.1
30 4.2	2 4.2	4 4.3 (Quiz)
7 4.4	9 4.4	11 4.5
14 	16 4.5	18 4.6
21 4.6	23 Review	25 Exam
28 4.7	30 5.1	1-Nov 5.2
4 5.3/5.5 (overview)	6 6.1	8 6.1/6.2 (Quiz)
11 6.2	13 6.3	15 6.3/6.4
18 6.4	20 Review	22 Exam III
25 	27 	29 
2-Dec 7.1	4 7.2	6 7.3
9 7.4	11 	13 Finals Week!(Note ours is 8:00 yesterday ☺)

Prepared: August 2013