Fayetteville State University
College of Arts and Sciences
Department of Mathematics and Computer Science
MATH 611 Linear Algebra II
Fall 2010

I. Locator Information:

Instructor: Dr. Guanghua Zhao
Course # and Name: MATH 611 Linear Algebra II
Semester Credit Hours: 3
Day and Time Class Meets: TR 6:00-7:15PM SBE 108
Total Contact Hours for Class: 45

Office Location: SBE 347
Office hours: TR 2:00-3:45 & 5:00-6:00 F 2:00-4:00
Office Phone: (910) 672-1500
Email address: gzhao@uncfsu.edu

FSU Policy on Electronic Mail: Fayetteville State University provides to each student, free of charge, an electronic mail account (username@broncos.uncfsu.edu) that is easily accessible via the Internet. The university has established FSU email as the primary mode of correspondence between university officials and enrolled students. Inquiries and requests from students pertaining to academic records, grades, bills, financial aid, and other matters of a confidential nature must be submitted via FSU email. Inquiries or requests from personal email accounts are not assured a response. The university maintains open-use computer laboratories throughout the campus that can be used to access electronic mail.

Rules and regulations governing the use of FSU email may be found at http://www.uncfsu.edu/PDFs/EmailPolicyFinal.pdf

II. Course Description: The second course of a two-semester sequence, including such topics as vector spaces, linear independence and bases, dual spaces, inner product spaces, modules, extension fields, roots of polynomials, elements of Galois theory, solvability by radicals, Galois groups over the rationals, algebra of linear transformations, matrices, canonical forms; triangular form, Nilpotent transformation, Jordan form, rational canonical form, Hermitan, unitary, and Normal transformations real quadratic forms.
Prerequisite: MATH 507.

III. Disabled Student Services: In accordance with Section 504 of the 1973 Rehabilitation Act and the Americans with Disabilities Act (ACA) of 1990, if you have a disability or think you have a disability to please contact the Center for Personal Development in the Spaulding Building, Room 155 (1st Floor); 910-672-1203.

IV. Textbook: Jin Ho Kwak and Sungpyo Hong, *Linear Algebra*, Second Edition, Birkhauser, Boston, 2004. ISBN 0817642943

V. Student Learning Outcomes - Upon completion of this course, students will be able to: .

- Understand inner products of vectors and their applications.
- Understand eigenvalues and eigenvectors, and their applications.
- Understand the properties of complex vector spaces.
- Understand the properties of Jordan canonical forms.
- Understand the properties of quadratic forms.

VI. Course Requirements and Evaluation Criteria:

1. It is the responsibility of the students to avail themselves of all class meetings, and individual help from their instructor.

2. Students are responsible for maintaining a notebook of problems selected by the instructor. Students are encouraged to include as many additional problems as possible. The homework for a chapter is due one week after the chapter is finished.

3. There are two (2) exams: a midterm and a final. The final examination is cumulative, i.e., it covers the contents of all chapters.

4. Students are expected to enter the classroom on time and remain until the class ends.

5. Students must refrain from smoking, eating and drinking in the classroom. The rights of others must be respected at all times.

6. Students are encouraged to ask questions of the instructor in class and to respond to those posed by the instructor. They should not discourage others from raising or answering questions. Often, other students have the same questions which they wish to ask, but are hesitant to do so.

7. Talking in class between students is strictly unacceptable. Discussions should be directed to the instructor.

8. Dishonesty on graded assignments will not be tolerated! Students must neither give nor receive any assistance on any work to be graded. The University's cheating policy will be applied for any violations. The minimum penalty will be a grade of zero (0) on the assignment.

The grading scale and weights given to various activities for evaluation are given below.

Homework -40% **Midterm**-30% **Final Exam-**30%
A 90-100% **B** 80-89% **C** 70-79% **D** 60-69% **F** Below 60%

VII. Academic Support Resources:
Extra help is available from the instructor during office hours.

VIII. Course Outline and Assignment Schedule (SEE ATTACHED SCHEDULE)
*** SUBJECT TO CHANGE FOR THE OPTIMUM BENEFIT OF THE CLASS**

IX. Teaching Strategies:
The majority of the material of the course will be given in lecture format. Group discussions and student presentations may be used.

X. Bibliography:

1. Howard Anton, Elementary Linear Algebra, John Wiley & Sons, Inc., New York, 1994.
2. S. K. Berberian, Linear Algebra, Oxford University Press, New York, 1992.
3. V. V. Prasolov, Problems and Theorems in Linear Algebra, American Mathematical Society, 1994.
4. P. Lancaster and M. Tismenetsky, The Theory of Matrices, Academic Press Inc., New York, 1985.
5. S. I. Grossman, Elementary Linear Algebra, Harcourt College Publishers Publishing Company, 1995.
6. R. Bellman, Introduction to Matrix Analysis, McGraw-Hill, New York, 1960.
7. F. R. Gantmakher, The Theory of Matrices, I,II, Chelsea, New York, 1995.
8. P. R. Halmos, Finite-dimensional vector spaces, Van Nostrand, Princeton, NJ, 1958.
9. A. Horn and C. R. Johnson, Matrix Analysis, Cambridge University Press, Cambridge, 1986.
10. C. G. Cullen, Matrices and Linear Transformations, Addison Wesley, Reading, MA, 1972.
11. Peter J. Olver and Chehrzad Shakiban, Applied Linear Algebra, Pearson Prentice Hall, 2006.
12. W. Keith Nicholson, Linear Algebra with Applications, 5th edition, ITP, 2006.

VII* COURSE OUTLINE

In case FSU must close for an emergency during the semester, instruction will continue using Blackboard.

Sections /Topics

[5.1] Dot products and inner products
[5.2] The lengths and angles of vectors
[5.3] Matrix representations of inner products
[5.4] The Gram-Schmidt orthogonalization
[5.5] Projections
[5.6] Orthogonal projections
[5.7] Relations of fundamental subspaces
[5.8] Orthogonal matrices and isometries

[6.1] Eigenvalues and eigenvectors
[6.2] Diagonalization of matrices

[6.4] Exponential matrices
[6.6] Diagonalization of linear transformations

Midterm Exam

[7.1] The n-space C^n and complex vector spaces
[7.2] Hermitian and unitary matrices
[7.3] Unitarily diagonalizable matrices
[7.4] Normal matrices

[8.1] Basic properties of Jordan canonical forms
[8.2] Generalized eigenvectors
[8.3] The power A^k and the exponential e^A
[8.4] Cayley-Hamilton theorem
[8.5] The minimal polynomial of a matrix

[9.1] Basic properties of quadratic forms
[9.2] Diagonalization of quadratic forms
[9.3] A classification of level surfaces
[9.4] Characterizations of definite forms
[9.5] Congruence relation
[9.6] Bilinear or Hermitian forms
[9.7] Diagonalization of bilinear or Hermitian forms

Final Exam: Monday, May 3, 6:00-7:50pm