DEPARTMENT OF MATHEMATICAL SCIENCES
United States Military Academy
West Point, New York 10996

January 23, 2002

2001-2002
INSTRUCTIONAL MEMORANDUM
NUMBER 489d-2

ELECTIVE—MA489—MATRIX ANALYSIS AND APPLIED LINEAR ALGEBRA

1. **Purpose**: This memorandum provides general guidance, course objectives, and lesson assignments for MA489d for the second term, AY 2002.

2. **Texts**:

a. *Matrix Analysis and Applied Linear Algebra* , Carl D. Meyer, Society for Industrial and Applied Mathematics, 2000.

b. *Solutions Manual to Accompany Matrix Analysis and Applied Linear Algebra* , Carl D. Meyer, Society for Industrial and Applied Mathematics, 2000.

c. (Optional) *Linear Algebra with Applications (Sixth Edition),* Steven J. Leon, Prentice Hall, 2002.

d. (Optional) *Linear Algebra: Modules for Interactive Learning Using Maple 6®*, by the *Linear Algebra Module Project (LAMP),* Eugene A. Herman, Michael D. Pepe, Robert T. Moore, and James R. King, Addison Wesley Longman, 2001.

3. **General Instructions**: Policies and procedures of the Department of Mathematical Sciences published for the core mathematics program remain in effect for elective courses, except when amended by the instructor or when obviously not applicable.

4. **Scope**: This course emphasizes both the computational and theoretical aspects of linear algebra one encounters in many subjects ranging from economics to engineering. The course covers most of the topics encountered in MA371 Linear Algebra in greater depth. The foundational aspects of vector spaces and linear transformations to include linear dependence and independence, subspaces, bases and dimension, inner products, and orthonormalization are further developed. This is rounded out with a detailed investigation and apllication of eigenvalues and eigenvectors as they relate to diagonalization and systems of difference equations. A software package is used to compute solutions to problems. Applications of the course material are included in the form of special problems to illustrate its wide scope.

5. **Course Grades**: The point distribution for course grades is as follows.

EXERCISE	NUMBER	POINTS EACH	TOTAL
Projects	10	100	1000
Portfolio & Reflective Summary	1	200	200
TOTAL			1200

Projects are due in accordance with the dates indicated on the course syllabus, and will be submitted in accordance with *Documentation of Written Work*, Office of the Dean, August, 2000.

6. **Course Goals**:

- Apply the fundamental concepts of linear algebra to a variety of interdisiplinary problems.
- Further develop math modeling and problem solving skills using linear algebra.
- Further develop the conceptual understanding of foundational ideas in linear algebra.
- Use computing technology to efficiently solve linear algebra problems.
- Communicate mathematical ideas and results in clear and effective ways.

7. **Course Philosophy and Guidance**: Unlike MA371, this course is not organized in a manner that parallels the textbooks and has very little structure. Topics in the course are driven by application projects. The projects will require student to be familiar with fundamental concepts covered in an introductory linear algebra course. The project background material required for each project is left for the student to struggle with. The course does not meet on a regular basis; however, I expect students to schedule one-hour per week to meet with me to discuss progress on projects. Students are welcome to sit in on MA371 during I- or J-hours on a space available basis.

It will be necessary to use a computer algebra system to complete most of the projects. I recommend that you use *Maple 6*®. USMA has a site lisence for *Maple 6*®, and each student will be responsible for loading it onto their personal computer and insuring that it works properly. The *LAMP* package, included with the optional textbook (d), will be helpful. *Matlab* and *Mathematica* are also available.

The student portfolio is a collection of the project reports submitted by the student. It provides evidence of mastery of course material. A reflective summary about the course, lessons learned, and mastery is part of the portfolio. The reflective summary should be at least two typed pages, double-spaced.

Jeffrey S. Strickland
Lieutenant Colonel, FA49/Armor
Assistant Professor & Course Director