WORCESTER POLYTECHNIC INSTITUTE
MATHEMATICAL SCIENCES DEPARTMENT

MA2071 - Matrices and Linear Algebra 1 – Section C05A
Term C'11 – January 13 – March 4

Instructor: Professor Peter R. Christopher Office: SH 305B
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Office Hours: Monday - 3:00-3:50pm
Tuesday - 2:00-2:50pm
Thursday – 11:00-11:50am, or by appointment.

Peer Learning Assistant (PLA): Rebecca Meissen (rmeissen@wpi.edi)

Class Hours: MTRF – 1:00–1:50pm, SH 309

Conference Session: Wednesday: 1:00-1:50pm SH 202

Text: David C. Lay, Linear Algebra and its Applications, Updated 3rd edition, Pearson/Addison Wesley.

Course Goals:

1. Learn the language and methods of linear algebra.
2. Develop an appreciation of abstraction and mathematical rigor.
3. Appreciate the power of linear algebra to solve real-world problems.
4. Apply technological tools as an aid to computation.
5. Build a strong foundation in the subject, so that you have the ability to research and solve more advanced problems.

About Section C05A:

This class is for students who want a deeper than usual understanding of basic linear algebra. Students in this class should enjoy mathematical challenges and should be interested in the "why" as well as the "how" of linear algebra. This course should serve as a bridge to advanced mathematics.

Grades and Requirements

Average scores in the 90s, 80s or 70s will guarantee grades of A, B, C, respectively. The following table gives the point value of each activity.

ACTIVITY	% POINTS
Test 1	28
Test 2	28
Test 3	28
Homework/Projects	10
Quizzes	6
Total	100

Homework

The suggested practice problems are listed on the syllabus. Completing these exercises is essential for you to master the material. While we will not collect syllabus problems, we will require you to pass in special homework problems, assigned with advanced notice. Some of these special problems may be challenging, and some problems may require technological assistance for their solution. We will not dictate which tools you should use. You may want to try MATLAB or the linalg package in MAPLE. You may communicate with others on the hand-in assignments; in fact, you are encouraged to work in teams, submitting papers with two or three names. Each person in a team should understand the whole, rather than just a portion of each assignment. In general, at WPI we expect an average of three hours of study for each hour of class.

Quizzes

The PLA will administer 5-10 minute quizzes during conference. We may also have an occasional quiz in class.

Tests

We have scheduled three tests to be taken in class. The emphasis is on concepts and processes more than quick answers.

Conferences

Participation in conferences is required. In these sessions you may be asked to participate in a cooperative learning environment. The TA is there to guide you in solving problems, rather than to solve problems for you.

Academic Honesty

You are strongly encouraged to work together on syllabus problems and assignments. However, you are required to work independently on quizzes and class tests, and possibly in other circumstances. You are expected to be familiar with the WPI Academic Honesty Policy.
(See http://www.wpi.edu/Pubs/Policies/Honesty)

Special Needs

If you have a disability or a medical condition that may require special consideration, please let me know. Students in this situation should also contact the Disability Services Office in Daniels Hall, 508-831-5235
(See http://www.wpi.edu/Admin/Disabilities/Services)

Resources

Your professor and PLA are eager to help you understand and appreciate (if not love) Linear Algebra. Please feel free to call upon us.

MA 2071 - MATRICES AND LINEAR ALGEBRA I
SYLLABUS

You should complete the following exercises as each topic is covered, or before if you wish. In addition, we may include applications from other chapters or from other sources. Please keep aware of possible changes, additions to, or omissions from the following list of topics, recommended exercises and scheduled activities.

Chapter 1 Linear Equations in Linear Algebra

1.1 Systems of Linear Equations p.11 5, 11, 13, 17, 25, 31, 33, 34
1.2 Row Reduction and Echelon Forms p.25 1, 7, 11, 13, 19, 29, 31, 33
1.3 Vector Equations p. 37 5, 7, 9, 11, 13, 17, 19, 29
1.4 The Matrix Equation $Ax = b$ p. 47 1, 5, 7, 9, 19, 13, 25, 33
1.5 Solution Sets of Linear Systems p. 55 1, 5, 11, 15, 23, 25, 35
1.6 Applications of Linear Systems p. 63 3, 5, 11
1.7 Linear Independence p.70 1, 5, 7, 9, 11, 15, 16, 17, 19, 21, 23, 27, 31, 33, 35, 37
1.8 Introduction to Linear Transformations p.79 1, 3, 7, 9, 11, 17, 19, 21, 31, 33
1.9 The Matrix of a Linear Transformations p.90 1, 3, 5, 13, 15, 17, 21, 23
1.10 Linear Models in Business, Science, and Engineering p.101 5, 9, 11, 14

Test 1 - Friday, January 28

Chapter 2 Matrix Algebra

2.1 Matrix Operations p. 116 5, 7, 9, 15, 27, 37
2.2 The Inverse of a Matrix p.126 1, 5, 9, 11, 13, 27, 31, 33, 37, 39
2.3 Characterizations of Invertible Matrices p.132 3, 7, 11, 13, 15, 17, 19, 23, 27
2.4 Partitioned Matrices p.139 7, 21
2.5 Matrix Factorizations p. 149 1, 9, 25
2.7 Applications to Computer Graphics p. 166 3, 5, 11, 19

Chapter 3 Determinants

3.1 Introduction to Determinants p.190 7, 9, 11, 15, 25, 29, 37
3.2 Properties of Determinants p.199 1, 3, 11, 15, 17, 19, 21, 25, 31, 33, 39

Test 2 – Monday, February 14

Chapter 4 Vector Spaces

4.1 Vector Spaces and Subspaces p. 223 7, 11, 13, 15, 17, 21, 23, 31
4.2 Null Spaces, Column Spaces, and Linear Transformations p. 235 1, 3, 17, 25, 29, 31, 33, 34, 35
4.3 Linearly Independent Sets; Bases p.243 1, 3, 5, 9, 13, 19, 21, 33
4.4 Coordinate Systems p.253 1, 5, 9, 11, 15, 27
4.5 The Dimension of a Vector Space p.261 5, 7, 9, 11, 13, 17, 19, 21, 23, 29

4.6 Rank p.269 1, 5, 9, 15, 17, 21, 23
4.7 Change of Basis p.276 1, 5, 7, 11
4.9 Applications to Markov Chains p.296 3, 15

Chapter 5 Eigenvalues and Eigenvectors

5.1 Eigenvectors and Eigenvalues p.308 1, 7, 21, 25, 29
5.2 The Characteristic Equation p.317 1, 9, 15, 19, 25
5.3 Diagonalization p.325 1, 7, 11, 13, 21, 23, 25

Chapter 6 Orthogonality and Least Squares.

Topics will be selected from this chapter, as time permits

Test 3 – Friday, March 4