SYLLABUS

MA242 Linear Algebra

Professor: Steve Rosenberg
Office: MCS 248
Office Hours: Tuesday 10:30-12, Friday 10-11 or by appointment
Course Hours: MWF 1:25-2:15 in MCS B33; discussion W 2:30-3:20 in MCS B33
Website: math.bu.edu/people/sr
Course Website: Blackboard via learn.bu.edu
Email: sr@math.bu.edu; Be sure to check your Blackboard regularly for course announcements.

Material: The course will cover the basic concepts of systems of linear equations and their solutions. The first half of the course will emphasize calculational techniques, with applications to physics, applied mathematics, economics and engineering. The second half of the course will cover matrices as linear transformations on vector spaces. We will cover Chapters 1-6.

Grading: A) There will be two in-class exams and a final. Each in-class exam will be on a Wednesday, and will last for 75 minutes.

    B) There will be a brief quiz at the beginning of each discussion section.
    C) The in-class exams each count for 20% of the grade, the final counts for 20%, the quizzes count for 10%, and homework counts for 30%.
    D) The only acceptable excuses for missing an exam, quiz or homework due date are legal reasons such as jury duty, substantiated illness, family emergency or religious reasons. Make-up exams for in-class exams are not given. If you miss an in-class exam for an acceptable reason, your remaining in-class exam will count for 40% of your grade.

Homework: The homework assignments are listed below. Homework will be due one week after it is assigned. Late homework will not be accepted. Since the answers to the odd-numbered problems are in the back of the book, you must give complete answers on all problems to receive credit. I cannot emphasize enough the importance of doing the homework problems – I think it is impossible to do well in the course without keeping up with the homework. You are welcome to work with others on your homework.

Computer packages: Some homework problems will involve computer calculations. The easiest website is Wolfram Alpha, which has worked linear algebra examples at https://www.wolframalpha.com/examples/Matrices.html. You must include a screenshot of your work for these problems.

There are several other computer algebra packages available. Go to the book’s website at http://wps.aw.com/aw_lay_linearalgebra_5/ and click on student resources to find
introductions to computer algebra packages (Getting Started with Technology in the left hand column) such as Mathematica and Matlab. You can download all data sets to avoid tedious typing in of data by clicking on Data Sets in the left hand column. Free student versions of Matlab and Mathematica are available if you log onto your BU account at the computer lab Common@Mugar at Mugar Library. Once you log on, hit the Start button, then select Run, then enter Matlab or Mathematica. Both programs come with tutorials.

For remote access to Matlab and Mathematica, you will need to get an account on the scc-lite.bu.edu server. You will need to install X window software on you computer. Information on getting an scc-lite account and free versions of X window software for PCs and Macs are available at http://www.bu.edu/tech/services/support/desktop/computer-labs/unix/

You can use another system (such as TI-86, TI-85, etc.) if you prefer.

Cheating: Boston University’s policies on cheating and plagiarism are spelled out in the BU Academic Conduct Code, available at http://www.bu.edu/academics/resources/academic-conduct-code/, and will be followed in this class.

Cell phones: Looking at your cell phone is not mandatory in class.

Outline of Contents

Chapter 1. Linear Equations in Linear Algebra
1.1 Systems of Linear Equations Hwk: #1,5,8,9,14,19,30,33,34
1.2 Row Reduction and Echelon Forms Hwk: #1,6,9,16,25,26,33,34
1.3 Vector Equations Hwk: #1,4,5,8,9,12,27,28,29
1.4 The Matrix Equation $Ax = b$ Hwk: #1,5,7,10,12,13,17,20,26,31,35
1.5 Solution Sets of Linear Systems Hwk: #1,5,8,11,13,16,18,36
1.6 Applications of Linear Systems Hwk: #3, 12, 14
1.7 Linear Independence Hwk: #1,6,19,20,31,32,40
1.8 Intro to Linear Transformations Hwk: #1,4,9,11,14,16,19,22,23,25,29
1.9 The Matrix of a Linear Transformation Hwk: #1,6,7,8,12, 18, 24
1.10 Business, Science, Engineering Applications Hwk: #2,8, 10, 11

Chapter 2. Matrix Algebra
2.1 Matrix Operations Hwk: #1,4,5,23,24,28,30,31,33
2.2 Inverse Matrix Hwk: #1,5,7,10bc,12,21,22, 40
2.3 Characterizations of Invertible Matrics Hwk: #1,5,10,16,26,32
2.7 Computer Graphics Hwk: #1,3,4,5,8,11,15,16,17,18,21

Test 1, Wednesday, October 24*

Chapter 3. Determinants
3.1 Introduction to Determinants Hwk: #1,2,9,10,15,16,38, 41
3.2 Properties of Determinants  Hwk: #5,11,15,17,19,28, 29
3.3 Cramer’s rule, etc.  Hwk: #19,21,23,32

Chapter 4. Vector Spaces
4.1 Vector Spaces and Subspaces  Hwk: #1,3,4,5,6,9,11,14,16,19,20,21,27
4.2 Null spaces, etc.  Hwk: #1,5,6,7,16,29,31,33,34,38,39
4.3 Bases  Hwk: #1,8,11,14,33
4.4 Coordinate Systems  Hwk: #1,8,9,12,13,17,21,28,36
4.5 Dimension of a Vector Space  Hwk: #1,8,9,12,13,20,21,24,27,29,34
4.7 Change of Basis  Hwk: #1,4,6,9,13,14,17,18
4.9 Applications to Markov Chains  Hwk: #1,4,5,7,15

Test 2, Wednesday, November 28*

Chapter 5. Eigenvalues and Eigenvectors
5.1 Eigenvectors and Eigenvalues  Hwk: #1,6,11,22abd,31,37,38
5.2 The Characteristic Equation  Hwk: #1,10,13,20,21,24 30
5.3 Diagonalization  Hwk: #1,6,11,22,23,28,31,33
5.5 Complex Eigenvalues  Hwk: #1, 7, 8, 13, 27
5.6 Discrete Dynamical Systems  Hwk: #1,3,4,5,9,10,16

Chapter 6. Orthogonality and Least Squares
6.1 Inner Product, etc  Hwk: #1,4,7,11,14,17,20,30
6.2 Orthogonal Sets  Hwk: #1,8,11,14,17,24,26,27
6.3 Orthogonal Projections  Hwk: #1,4,7,11,14,17,25
6.4 Gram-Schmidt  Hwk: #1,9,24
6.5 Least-Squares Problems  Hwk: #1,3,5,7,10
6.6 Applications to Linear Models  Hwk: #1,7,8,10,11

Final Exam: Friday, December 21, 12:30-2:30 pm

*Warning: The dates of the in-class exams may be changed.