January 10, 2015

Cleveland State University
Mathematics 288 Spring Semester 2015
Syllabus

Class Basics

Course Title: MTH 288 Linear Algebra
Course Topics: Topics include systems of linear equations, matrices, determinants, vector spaces, linear transformations, eigenvalues, and eigenvectors.
Credits: 3 credit hours. Only two of these three credits may be counted toward graduation by students who have passed MTH 284.
Prerequisite: A grade of C or better in MTH 182 (Calculus II)
Class Time: Monday, Wednesday, and Friday 10:15–11:05 p.m. (50 minute classes)
Classroom: MC 330
First Day of Class: Monday January 12
Last Day of Class: Friday May 1
Final Exam: Monday May 4, 10:15–12:15
Holidays: MLK (January 19); Presidents’ Day (February 16); Spring Recess (March 9–13)
Last Day to Drop (without a W): January 23
Last Day to Withdraw (with a W): March 27

Instructor and Office Hours

My name is Gregory Lupton, my office is RT1556 and my telephone number is 687–4714. You can leave a message for me at this number, or e-mail me at g.lupton@csuohio.edu.

Office hours are Monday 9:00–10:00 and again 2:30–3:30, and Tuesday 8:30–9:30. If you’d like to see me outside class time, then please try to make it in these office hours. If you can’t make it in office hours, then speak to me after class or call me, or e-mail me, to set up an appointment for some other time. Even if you’re coming in office hours it’s still a good idea to try and let me know in advance that you’re coming. I will normally be unavailable at certain times: Monday, Tuesday, Wednesday and Friday from
1:30–2:20, when I teach another class; Tuesday 10:00–12:00 and Wednesday 12:00–1:00, when I have standing meetings. I work off-campus Thursdays. I frequently have committee meetings Wednesday afternoons; I often have a seminar Friday afternoons.

**Student Outcomes**

The successful MTH288 student should be able to:

- Understand algebraic and geometric representations of vectors in $\mathbb{R}^n$ and their operations, including addition, scalar multiplication and dot product. (Section 2.1)

- Solve systems of linear equations using Gauss-Jordan elimination to reduce to echelon form. Solve systems of linear equations using the inverse of the coefficient matrix when possible. Interpret existence and uniqueness of solutions geometrically. (Section 1.2)

- Perform common matrix operations such as addition, scalar multiplication, multiplication, and transposition. Discuss associativity and non-commutativity of matrix multiplication. (Section 3.2)

- Discuss spanning sets and linear independence for vectors in $\mathbb{R}^n$. For a subspace of $\mathbb{R}^n$, prove all bases have the same number of elements and define the dimension. Prove elementary theorems concerning rank of a matrix and the relationship between rank and nullity. (Section 2.3)

- Interpret a matrix as a linear transformation from $\mathbb{R}^n$ to $\mathbb{R}^m$. Discuss the transformation’s kernel and image in terms of nullity and rank of the matrix. Understand the relationship between a linear transformation and its matrix representation, and explore some geometric transformations in the plane. Interpret a matrix product as a composition of linear transformations. (Sections 3.1–3.3, 4.1)

- Use determinants and their interpretation as areas and volumes. Describe how row operations affect the determinant. Analyze the determinant of a product algebraically and geometrically. (Sections 5.1–5.3)
• Define eigenvalues and eigenvectors geometrically. Use characteristic polynomials to compute eigenvalues and eigenvectors. Use eigenspaces of matrices, when possible, to diagonalize a matrix. (Sections 6.1–6.4)

• Use axioms for abstract vector spaces (over the real or complex fields) to discuss examples (and non-examples) of abstract vector spaces such as subspaces of the space of all polynomials. (Section 7.1)

• Discuss the existence of a basis of an abstract vector space. Describe coordinates of a vector relative to a given basis. For a linear transformation between vector spaces, discuss its matrix relative to given bases. Discuss how those matrices changes when the bases are changed. (Sections 7.1–7.3, 6.3)

Textbook

Our textbook is *Linear Algebra with Applications* by Jeffrey Holt. You should get a copy as soon as possible. We’ll start working methodically through this book immediately. I have an e-version of the book, which I will use to refer to in class. We will cover material from chapters 1–7 fairly thoroughly.

I plan to cover this material from the book on the schedule at the end of this handout.

Technology

In class I will use a TI 84+ calculator. This is a crude choice for linear algebra, but it will serve for pedagogical purposes, and for the sort of low-end, small-sized calculations we will typically do.

The best available software for linear algebra is MATLAB. Although we will not use MATLAB in a formal way in this course, I may refer to it from time-to-time. It is available for your use in our Department of Mathematics computer labs, if you’d like to try using it.

As a student in this class, you have full access to the Department of Mathematics computer lab facilities—including printing—whenever these labs (RT 1501 and MC 435) are available. If you would like to use a lab, then feel free to do so. When a class is held in the lab, the students in that class have
priority for the machines. However, if the class is small enough, or if there is no class being held at that time, then you can use any unoccupied machine. Also, you are welcome to use the “satellite lab,” RT1530, each of which has the same facilities as are available in the labs.

**Work to be turned in and grades**

Grades are based on homework, exams, in-class quizzes, and class attendance/participation.

**Homework:** You should work homework exercises on a regular and ongoing basis, keeping up with where we are in class. Working homework exercises is an important part of reading and understanding the material.

This course uses the WeBWorK (WW) online homework system, accessible through the following link:

http://webworks2.csuohio.edu/webwork2/MTH288-Spring15/

Please bookmark this link for easy access. Use Firefox, Safari or Chrome to access WEBWorK. Internet Explorer is not recommended, since it is slower and does not display some problems correctly. Due dates for each assignment are given on the schedule at the end of this handout (as well as in WW). There will be no extensions for homework assignments. Please do not wait until the due day to start the homework. Indeed, there is a small incentive offered for you to make progress on each assignment well in advance of the due day (see below). Not being able to access the system will not be accepted as a valid excuse for late homework. Different homework sets may have different numbers of problems, but all problems have the same overall weight (one point each problem). Your score for this component will be determined by the percent of problems you have worked correctly out of the total number of problems (which will be about 150–175 over the semester).

As well as the graded WW HW Exercises, I’ll give you a separate list of recommended homework exercises from our textbook. Working these HW problems, as well as the WeBWorK problems, will help you master the material. Although I will not take in and score these recommended homework exercises, you should ask in class (or ask me individually) if you have problems with any of them.

**Quizzes:** We will have a short, in-class quiz most Fridays. These will typically test you on basic material such as vocabulary and definitions, or a standard type of computation. They will correspond with the material that
is currently being studied, so they will test whether you are keeping up with the reading. I will use the average of 10 of your quiz scores to score this component. In most cases, this will be your 10 highest scores. However, any quiz that you miss due to an unexcused absence will be scored as 0, and included in your 10 scores.

**Exams:** Three midterm exams and a final exam. Each exam is closed book. The three midterms will last for the 50-minute class period. The final will last the length of our exam period, namely 2 hours. Midterms are on Wednesdays: 2/5; 3/4; 4/8. The final exam is on Monday 4th May, 10:15 a.m.–12:15 p.m. These dates are given on the schedule at the end of this handout. All exams are held in our classroom. I will give out sample exams before each exam. The three midterms are worth 36% of your overall score. To score this component, I’ll use the average of your highest two scores on the three midterms (exception: if you miss a midterm due to an unexcused absence, that midterm will be scored as 0, and I will score this component using all three of your midterm scores).

**Attendance and participation:** I expect everyone to attend every class, unless there is some pressing reason for an absence (e.g. medical emergency). If you know you must be absent, then try to let me know in advance of class, as a courtesy. With documentation (e.g. Doctor’s note), your absence may be excused. I’ll use the following formula to assign the 10% of your overall score corresponding to attendance and participation: 2 or fewer unexcused absences = 10%; 3 unexcused absences = 9%; 4 unexcused absences = 8%; 5 unexcused absences = 5%; 6 or more unexcused absences = 0%. Furthermore, 3 or more unexcused absences means you are ineligible for the extra credit opportunity described below. (Also, missing that many classes will negatively impact your likelihood of succeeding in the course in other ways.)

Your letter grade will be determined by the points that you accumulate from each component. The weighting of these components is as follows: Midterm Exams—36%, Final Exam 24%, WW Homework—20%, Quizzes—10%, Attendance and Participation—10%.

Your scores from the various components will be combined into a total percent, and converted into a letter grade, as follows:
A student with a total score of less than 60% will get an F in the course.

**Extra Credit Opportunity**

For each WW HW set that you complete 50% or more correct, by midnight of the Wednesday before it is due, you will be credited 1 point. At the end of the semester, I will figure your number of points out of the total number of sets, and you will get that fraction of 4% added to your total % for the course, *subject to meeting the minimum attendance expectation described above*. That is, three or more unexcused absences means you are ineligible for the extra credit opportunity.

**Make-Up Policy**

No make-ups on quizzes or homeworks. For exams, a make-up would be possible if I am given advance notice of your inability to take the exam at the scheduled time, and documentation of the reason for your absence (e.g. hospital note for a medical emergency). Any make-ups must be taken no later than three weekdays after the scheduled exam (typically the following Monday).

**Scholastic Dishonesty**

Cheating of any form is not acceptable and it will be dealt with harshly if detected. If not detected, you will still be punished since you will be ill-prepared for future exams in this course or future courses. In addition, it degrades the value of a CSU degree.

Copying work done by others, in or out of class, is an act of scholastic dishonesty and it will be prosecuted to the full extent allowed by university
policy. Collaboration on assignments is permitted and encouraged, however if you submit work with your name on it then it is expected that you understand that material and would be able to do subsequent work on that material without assistance. For more information regarding scholastic dishonesty, see the Code of Student Conduct.

**Disabilities Statement**

Educational access is the provision of classroom accommodations, auxiliary aids and services to ensure equal educational opportunities for all students regardless of their disability. Any student who feels he or she may need an accommodation based on the impact of a disability should contact the Office of Disability Services at (216) 687-2015. The Office is located in MC 147. Accommodations need to be requested in advance and will not be granted retroactively.