

Syllabus for MATH 204: Linear Algebra Fall Semester 2018

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Office Hours: M: 11:15am-12:15pm, W: 3:00-4:30pm, Th: 2:15-3:45pm, F: 3:00-4:00pm, and by appointment

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Class: held MWF: 1:55pm-2:50pm in Eaton 110

Textbook: *Linear Algebra and its Applications*, by David Lay, Steven Lay and Judi McDonald

Website: <http://math.hws.edu/eking/LinearAlgebra/math204.html>

Course Content and Organization

Suppose we are placed on a diet of rice and beans. We need to figure out how many cups of each we should eat per day so that we get a healthy amount of protein and vitamin A. If we know how many units of protein and vitamin A a cup of rice or beans contains, and how many units of each nutrient we need, we can set up a system of two linear equations the solution of which will dictate our minimum diet.

Linear Algebra begins with looking at this familiar problem of solving systems of linear equations. In previous math courses, we have seen different ways of solving systems of linear equations that usually contain only two or three equations with two or three variables. We will learn new methods to solve these systems that can be applied to much larger systems of linear equations. Our example above is a simplified version of a real world problem (perhaps in the context of creating a diet or of providing food for the hungry) for which we would need to consider more nutrients (and hopefully more food choices)! Studying these techniques for solving larger systems will lead to the study of matrices, linear transformations and vector spaces. It turns out that many mathematical objects can be characterized as vector spaces, because of their underlying common structure. This fact means that all the interesting theorems you will prove about general vector spaces will be able to be applied to any vector space encountered! Hence it is not surprising that Linear Algebra is a prerequisite for most of our upper level courses, both applied and theoretical.

Outline of Topics

This outline is meant to give you a general idea of how we will proceed through the text. It will be adjusted as necessary during the term.

Weeks/Dates	Sections	Topics
Weeks 1–4	1.1–1.8	Linear Systems and Matrix Transformations
Monday, September 24	Exam 1	Chapter 1
Weeks 5–6	1.9, 2.1–2.3	Matrix Algebra
Weeks 7–8	3.1–3.2	Determinants
Monday, October 22	Exam 2	Chapters 2–3
Weeks 9–12	4.1–4.4	Vector Spaces
Friday, November 16	Exam 3	Chapter 4
Weeks 13–14	4.5, 4.6, 5.1–5.3, 5.6	Eigenvalues and Eigenvectors
Monday, December 17	Final Exam	Cumulative

Goals and Prerequisites

The main goal of the course is for you to develop dexterity with and understanding of certain mathematical structures that pervade higher level mathematics. Specifically, you should become familiar with creating and solving linear systems, defining and manipulating matrices with matrix operations, finding and using determinants of matrices, and finding the basis of a vector space, in addition to being familiar with linear transformations, eigenvalues, eigenvectors, and the structure and properties of vector spaces.

The second, vital goal is for you to gain skills in understanding and writing abstract mathematical proofs, in making oral mathematical arguments, and in becoming a more independent mathematician. It is assumed that your presence in this class represents a certain amount of commitment to mathematics and either the major or the minor. Beware! Students often find the material at the beginning of this course to be easy and the latter, more abstract material more challenging. Do not be surprised if you need to increase the amount of time you spend on this course as the term progresses. Since this course material is integral to almost all upper-division courses, you should expect to spend 10 to 12 hours a week on this material outside of class. To reduce the amount of conscious time spent on this class, start assignments as soon as they are assigned! (You will be amazed at how much your mind can accomplish subconsciously if you give it the time!)

In order to enroll for this class, you must have earned a C or better in MATH 131 (Calculus II) or earned AP credit for that class. The Mathematics and Computer Science Department also highly recommends that you successfully complete MATH 135 (First Steps into Advanced Mathematics) before taking this course to form a foundation for reading and writing proofs. If you have not taken MATH 135 or feel that your proof writing skills are rusty, please read the free, online textbook *Book of Proof* by Richard Hammack. There is a link to the textbook on our website. In particular, you should read Chapters 2 and 4-7.

Assessment

Reading and practice exercises will be assigned each class day. Check the course website after each class for both graded and practice assignments. It is extremely vital to your understanding to read and complete the practice exercises. I recommend having a notebook in which you take notes on your reading, recording definitions and questions as well as other ideas, and work your practice exercises, as is required in MATH 135. While we will spend some time in lecture, much of our class time will be spent in discussions, group work and student presentation. In addition to your reading and practice exercise notebook, I also recommend that you form a study group with one or two other students in the class with whom to discuss these assignments. You are highly encouraged to attend my office hours as well.

WeBWorK: There will be one to three online WeBWorK assignments each week to review techniques and concepts. You will get immediate feedback from these exercises, which will allow you to assess your progress. Further, for most problems you will be allowed multiple attempts to obtain the correct answer. Students typically earn 90-100% on this part of the course. You may find these problems frustrating at first because you will have to be quite careful in entering your answers. Stick with it!

Quizzes: The majority of Monday classes will begin with a 10-15 minute quiz. These quizzes will typically have questions that ask you to give basic definitions or examples, state a theorem, or complete a short calculation. Extra time will not be allowed for those arriving late to class. **Under no circumstances may a quiz be made up.** Your lowest quiz score will be dropped.

Collected Homework: Roughly once a week you will turn in a written assignment in class, usually on Fridays. Assignments will include both calculations and proof-type questions. While you may discuss general ideas of these problems with others, the details and final write up should be **your own work**. All assignments should be turned in via paper and not email. Your work should be done neatly in pencil or typed. The point value of each written assignment will be determined by the length and complexity of the assignment, and thus will vary. Assignments will be considered late if they are not turned in at the beginning of class. You may turn in two late assignments (any time before Sunday at 1pm, 47 hours after it is due) without penalty.

Seminars: In addition to regular class time, you will be required to attend two mathematics/computer science seminar talks during the semester, at least one of which must be on mathematics. Seminars usually begin between 3pm and 5pm and last an hour (the days vary). You must be present and attentive for the entire talk to receive full credit.

Active participation: Your WeBWorK, collected assignments, quizzes, and seminar attendance will make up 25% of your course grade.

Exams: There will be three midterm exams: Monday, September 24th, Monday, October 22nd, and Friday, November 16th. **Note that each of these midterms will be in class but will begin at 1:25pm to allow you extra time. Also note that seating will be randomized for exams.** Each midterm will be worth 17% of your course grade, and will be cumulative, but will focus on the most recent topics. The final exam will be Monday, December 17th from 1:30pm until 4:30pm. The final exam will be cumulative and will be worth 24% of your course grade. It is impossible to construct fair makeup exams in mathematics. Thus, for your protection, my policy is that there are **no** makeup exams. **You must be present for all exams.**

Attendance: Your participation in class is necessary for success. Thus absences will greatly affect your grade. **More than three unexcused absences will lower your grade by at least one letter.** The greater the number of absences, the greater the reduction. Excused absences require documentation such as a letter from a dean. **Habitual tardiness will lower your grade. More than six absences will likely result in automatic failure.** Common courtesy demands that you be on time for class and that you remain in the classroom while class is in session unless it is an emergency. Cell phones should be turned off and stowed during the entire class period.

Disclaimer

The above exam dates, quantity of graded work, policies, and course layout are subject to change in the event of extenuating circumstances.

The Center for Teaching and Learning (CTL)

At Hobart and William Smith Colleges, we encourage you to learn collaboratively and to seek the resources that will enable you to succeed. The Center for Teaching and Learning (CTL) is one of those resources: CTL programs and staff help you engage with your learning, accomplish the tasks before you, enhance your thinking and skills, and empower you to do your best. Resources at CTL are many: Study Mentors help you manage your time and responsibilities, Writing Fellows help you think well on paper, and professional staff help you assess academic needs, to name a few. I encourage you to explore these and other CTL resources designed to inspire your very best work. You can talk with me about these resources, visit the CTL office on the 2nd floor of the library to discuss options with the staff, or visit the CTL website at <http://www.hws.edu/academics/ctl/index.aspx>.

If you are a student with a “disability” (or what I like to call a “nontraditional approach to learning”) for which you may need academic accommodations in this course, you should self-identify, provide appropriate documentation of your disability, and register for services with Disability Services at the Center for Teaching and Learning (CTL). Disability related accommodations and services generally will not be provided until the registration and documentation process is complete. The guidelines for documenting disabilities can be found at the following website: http://www.hws.edu/academics/ctl/disability_services.aspx

Please direct questions about this process or Disability Services at HWS to Christen Davis, Coordinator of Disability Services, at ctl@hws.edu or x 3351.

Academic Integrity

I highly encourage you to form a small group with whom you can discuss some of the reading and practice problems. Verbalizing your questions, explaining your mathematical ideas and listening to others will increase your understanding. However, you should **not** feel free to copy someone else’s work, ask someone else to edit your work, edit someone else’s work, **or** make your work available to someone else. **Copying constitutes plagiarism, a violation of academic integrity which could result in failure in the course. There is, of course, no collaboration or use of outside resources (including other textbooks and the internet) allowed on quizzes and exams.** Violation of the Colleges’ Principle of Academic Integrity will likely result in a report sent to your file in the dean’s office and/or appearance before the Committee on Standards.

How to Succeed

- Attend all classes.
- Do the reading and practice problems carefully, and bring completed reading sheets to class.
- Take good, complete notes during class.
- Start assignments early so that you have time to work on the assignment several times and see me, if necessary. This will give your mind beneficial subconscious/unstructured time to solve problems on its own.
- Spend some time each week working on the material from this class by yourself.
- Review the notes from the last class before coming to class again. Recopy the notes if appropriate. This makes preparation for a test easy.
- Participate in class discussions, and volunteer to present!
- Find one to two classmates with whom you can discuss the material outside of class.
- Ask your classmates and me lots of questions.
- Listen carefully to other students’ ideas.
- Complete your write-ups on your own, including doing your own editing.
- Use my office hours liberally.
- Have fun!

Textbook

We will use our textbook regularly. You will be expected to read it before we discuss each section and we will use it for practice exercises in class. At least one student from each group should bring a copy of the text to class each day (take turns where possible!). I have put a copy of the textbook on reserve in the library. If you purchase an electronic version of the text, ask permission to access it during class time.

First Collected Homework: Questionnaire, Essay and Meeting

Write a full one-page typed autobiography. I am not picky about spacing, font size and margin widths, but it should look nice, not like you are avoiding writing content. Discuss the following in your essay:

- your major and minor (or what you think they will be)
- any thoughts you have about what you would like to do after college
- the reason you chose to take this course
- your favorite and least favorite memories of mathematics
- your favorite mathematical topic
- what you expect to learn in this course and what your goals are for the course
- your favorite hobbies, and anything else interesting (for example, what you did over the summer).

The paper is due by 3:00pm tomorrow (Tuesday, August 28th) together with the questionnaire that you can find on our website, <http://math.hws.edu/eking/LinearAlgebra/math204.html>. You may hand these in personally to me, place them in the homework collection box if I have placed it outside my office door, or just slip them under my office door. This assignment also includes a short one-on-one meeting with me in my office after I have read your essay. Sign up for this appointment when you drop off your paper. Please bring a photo of yourself, with which you are willing to part, to the meeting (you do not need to have the photo when you turn in your essay). This meeting and the photo help me get to know each of you I do not, and catch up with those of you I do. Your grade on this assignment will be based on whether you address all the topics requested, as well as the quality of your writing (including good grammar and typography) and your prompt attendance at our meeting, photo in hand. It is critical that you are on time for your appointment! This assignment is worth 20 points. **Note:** if you had me for class in a previous semester you do not need to bring a photo, **but** you should make sure this essay is **significantly different** from the essay(s) you gave me then. It should update any of the topics listed above that have changed or discuss further topics you think are especially important to who you are.