# Math 232 - Linear Algebra

## Course Information

### Instructor and Course Meeting Information

*Instructor:* Lola Thompson
*E-mail:* lola.thompson@oberlin.edu
MWF 1:30-2:20 PM
*Location:* King 237
*Office:* King 200
*Office Hours:*
   M 2:30 - 4 (general)
   W 2:30 - 4 (priority Math 232)
   Th 11 - 12 (general)
   *And by appointment.

### Course Objectives

By the end of this course, you will be able to:

- Demonstrate mastery of the basic computational techniques of matrix algebra and vector spaces
- Write clear, precise mathematical proofs
- Apply your theoretical knowledge to solve real-world problems

### Textbook

*Elementary Linear Algebra* ($9^{th}$ edition) by B. Kolman and D. Hill. You can find used textbooks online (eg. Amazon.com) but please check to make sure that the edition matches the one that we are using.

For those who are not comfortable with reading and writing mathematical proofs, there are two recommended supplements: *How to Read and Do Proofs* by D. Solow and *How to Think Like a Mathematician* by K. Houston. These books are on reserve at Mudd Library.

### Grades

The grades in this course will be calculated as follows:

|  | number | percentage each | total percentage |
|---|---|---|---|
| Homework | 10 | 2% | 20% |
| Midterms | 3 | 15% | 45% |
| Final Exam | 1 | 35% | 35% |

### Homework Assignments

Your weekly homework assignment will be divided into two parts. One of the parts will be computational in nature, while the other will be more theoretical (i.e., proofs). Both parts of the homework assignment will be due on Fridays. Please staple them separately.

### Exams

There will be one in-class, closed-book midterm exam, as well as two open-book, take-home midterm exams. The final exam will be a closed-book, in-class exam. All take-home exams are due at the beginning of class. In particular, it is not acceptable to skip class in order to work on your exam for an extra hour!

### Blackboard

Copies of lecture notes, handouts, etc. can be found on the course Blackboard site. Go to `http://blackboard.oberlin.edu` to access these materials.

# Course Policies

### Academic Honesty

*Homework*
You are welcome to consult the course text, your class notes, and the instructor. I also encourage you to form study groups with other students, provided that you abide by the following guideline: you may discuss the general problem-solving techniques for homework problems with other students, but you must write up your solutions independently. You must also acknowledge any collaborators by listing their names at the top of each homework assignment.

*Exams*
You are not allowed to use any electronic device or consult any source other than the instructor during the in-class exams. In particular, this means *no calculators, smartphones, regular cellphones, iPods, eReaders, laptops, notes, textbooks, etc.* For the take-home exams, you may only use your textbook and your professor as resources (i.e., all other resources, including fellow humans, are off limits). You are on your honor not to talk to another student about an exam until both students have turned them in.

*Note:* Information about the Honor System at Oberlin can be found at the following website: `http://www.oberlin.edu/students/links-life/honorcode.html`. Please familiarize yourself with its content. All students are responsible for maintaining the highest standards of honesty and integrity in every phase of their academic careers. The penalties for academic dishonesty are severe and ignorance is not an acceptable defense.

### Attendance

Class attendance is not a formal part of your grade in the course. That said, students are expected to attend classes regularly. Excessive absences will adversely affect your performance on tests and homework assignments. If you have extenuating circumstances that may cause a prolonged period of absence from the course, please contact me immediately.

### Disabilities

Students in this course with disabilities, including "invisible" disabilities such as chronic diseases and learning disabilities, and who may need disability-related classroom accommodations, are encouraged to make an appointment to see their instructor as soon as possible.

### Make-up Policy

Typically, I will not accept late homework, and missed exams cannot be made up. That said, I understand that some circumstances are beyond your control. Should you contract a serious illness, please contact me immediately. I will be happy to make arrangements with you under these types of extreme circumstances. Please do not come to class if you have an influenza-like illness!

### Religious Observances

Some students may wish to take part in religious observances that occur during this academic term. If you have a religious observance that conflicts with your participation in the course, please meet with me before the end of the second week of the semester to discuss appropriate accommodations.

### Withdrawing From The Course

Students who receive failing grades on any of the midterm examinations are encouraged to speak with me immediately in order to determine the best course of action.

# Other Useful Information

**Seeking Help**

Because math topics have a tendency to build on one another, students may find it difficult to catch up after falling behind in their Math 232 coursework. Fortunately, there are a number of academic resources available to the students who seek them out:

1) *My office hours*: I am available at regularly scheduled times to answer your questions on the course material (see "Instructor and Course Meeting Information" above). I am also available to meet by appointment. In particular, I am always happy to discuss current homework assignments during office hours.

2) *Your classmates*: The other students in the course can be one of your most valuable resources. You are strongly encouraged to form study groups, provided that you abide by the policies outlined in the "Academic Honesty" section above.

3) *Tutoring*: Free tutoring services are available from the Office of Student Academic Services (`http://new.oberlin.edu/office/student-academic-services/tutoring.dot`). Kay Knight is the person to contact for tutoring in math courses. Kay is located in Peters Hall, Room 118. Her campus extension is x58464.

**Important Dates**

| | |
|---|---|
| Add/Drop Deadline | September 12th (Thursday) |
| Fall Break! | October 19th (Saturday) - October 27th (Sunday) |
| Withdraw and P/NP Deadline | November 5th (Tuesday) |
| Thanksgiving Break | November 28th (Thursday) - December 1st (Sunday) |
| Classes End | December 12th (Thursday) |
| Reading Period | December 13th (Friday) - December 16th (Monday) |
| Final Exam | December 19th (Thursday) |

# Course Schedule

The following is a rough schedule for the course. Please note that the test dates are tentative.

| Lectures | Section In Text | Brief Description |
|---|---|---|
| 9/4 | 1.1 | Introduction, Linear systems |
| 9/6 | 1.2, 1.3 | Matrices and matrix algebra |
| 9/9 | 1.4 | Matrix algebra |
| 9/10 | | *Optional: Proof-writing workshop @ 7 PM* |
| 9/11 | 1.5 | Matrix algebra |
| 9/13 | 2.1 | Echelon form (HW due) |
| 9/16 | 2.2 | Solving systems |
| 9/17 | | *Optional: Proof-writing workshop @ 7 PM* |
| 9/18 | 2.3 | Elementary matrices |
| 9/20 | 2.4 | Equivalent matrices (HW due) |
| 9/23 | 4.1 | Vector spaces |
| 9/25 | 4.2 | Vector spaces, Subspaces |
| 9/27 | | **Midterm Exam #1 (in class)** |
| 9/30 | 4.4, 4.5 | Span, Linear independence |
| 10/2 | 4.4, 4.5 | Span, Linear independence |
| 10/4 | 4.6 | Bases and dimension (HW due) |
| 10/7 | 4.6 | Bases and dimension |
| 10/9 | 4.7 | Homogeneous systems |
| 10/11 | 4.8 | Coords. and isoms. (HW due) |
| 10/14 | 4.8 | Coords. and isoms. |
| 10/16 | 4.8 | Transition matrices |
| 10/18 | 4.9 | Row space, column space, rank (HW due) |
| 10/21 - 10/25 | | No Class – Fall Break! |
| 10/28 | 4.9 | Rank |
| 10/30 | 5.1, 5.3 | Inner products |
| 11/1 | | No Class |
| 11/4 | 5.4 | Gram-Schmidt process (**Midterm Exam #2 due**) |
| 11/6 | 5.5 | Orthogonal complements |
| 11/8 | 5.5 | Orthogonal complements, Applications (HW due) |
| 11/11 | 5.6 | Applications |
| 11/13 | 6.1 | Linear transformations |
| 11/15 | 1.6, 6.2 | Matrix transformations, Linear transformations (HW due) |
| 11/18 | 6.3 | Matrix of a linear transformation |
| 11/20 | 6.4, 6.5 | Matrices and linear transformations as vector spaces, Similarity |
| 11/22 | 3.1 | Definition of determinant (HW due) |
| 11/25 | 3.2 | Properties of determinants |
| 11/27 | 3.3 | Cofactor expansion (**Midterm Exam #3 due**) |
| 11/29 | | No Class – Thanksgiving Break! |
| 12/2 | 3.4, 3.5 | Inverses, Cramer's rule |
| 12/4 | 7.1 | Eigenstuff |
| 12/6 | 7.2 | Diagonalization (HW due) |
| 12/9 | 7.2 | Diagonalization |
| 12/11 | 8.1 | Markov Chains (HW due) |
| 12/19 | | **Final Exam (7 - 9 PM)** |