

**Applied Linear Algebra, MA 415**  
**Mathematics 415**

Section	Location	Time
A	141 Loomis Laboratory	MWF 11:00am-11:50am

Instructor: Roy Araiza (raraiza@illinois.edu)

Graders: TBD

Office: Altgeld Hall 257A

Office hours: Mondays 9:30 am - 10:30 am, Wednesdays 12:00 pm- 1:00 pm

Webpage: <https://math.illinois.edu/directory/profile/raraiza>

REQUIRED ITEMS

**Text and WebAssign**

Our lectures will loosely follow the text Linear Algebra and its Applications (4<sup>th</sup> edition) by Gilbert Strang. All homework will be done on Webassign (see below).

GRADE

The components of your grade are as follows:

	% of Final Grade
Homework	10%
Quizzes	10%
Midterms	60%
Final Exam	20%

*There will be three midterms throughout the term. Your lowest midterm will be dropped from your final grade calculation and the other two will be weighted at 30% each.*

Compute your grade:

$$\text{HW} \cdot 10\% + \text{QUIZZES} \cdot 10\% + \text{Midterm} \cdot 30\% + \text{Midterm} \cdot 30\% + \text{FINAL} \cdot 20\%$$

**Homework:**

Following most lectures you will be able to access a corresponding homework assignment on WebAssign (see below). These assignments will be to develop the computational skills and understanding for previous lectures. You will typically have one week to complete a given homework assignment. The HW assignment will always be due by 11:59pm. I recommend that you complete the homework assignments on your own. Though, you may seek assistance on Piazza.

**Exam format:**

All midterms and the final will be multiple choice and taken on a scantron. The exams will test your computational and conceptual skills in the course. Due to the format of the exam there will be no partial credit on questions.

**Midterm exams**

We will have three 50 minute midterms which will be taken during the evening at 7:00pm in a location to be determined.

Midterm 1: Monday, 19 September

Midterm 2: Monday, 17 October

Midterm 3: Monday, 14 November

There will be ONE conflict exam time for each given midterm. It is the student's responsibility to notify the instructor at least one week in advance if they plan to take the conflict exam. If this is not done, then I cannot guarantee that you will be able to take the conflict.

### **Final Exam**

Final Exam Date: TBD

If there is a conflict with the date and time of the final exam then let me know ASAP. Finals exam week is **9-16 December**.

### **Quizzes**

Throughout the semester (typically weekly) you will be given quizzes which will test concepts developed throughout the semester. The problems on quizzes are the best practice for the difficulty and style of the conceptual questions which will be on the exams. The quizzes will be administered through Gradescope (see below).

### **Make-ups/Conflict Exams**

As previously stated, your lowest midterm (NOT FINAL) will be dropped from your final grade calculation. If, for whatever reason you miss a second exam, I will suggest that you go speak to a counselor in your college, so that you may determine what is the best route for the rest of the term. There will be **NO** make-ups for missed quizzes.

### **Cutoffs**

Maximum cutoffs for letter grades will be at the traditional 90%, 80%, etc., with plus and minus grades given at the following intervals (curves may be used to maintain historical grade distribution). Thus, this is subject to change.

A+	97 - 100
A	93 - 96.99
A-	90 - 92.99
B+	87 - 89.99
B	83 - 86.99
B-	80 - 82.99
C+	77 - 79.99
C	73 - 76.99
C-	70 - 72.99
D+	67 - 69.99
D	63 - 66.99
D-	60 - 62.99
F	59.99 and below

### **Midterm Grade**

The UG drop deadline for semester-long courses without a W is October 14<sup>th</sup>, with freshman midterm grades due by a date yet to be determined.

## **CLASS PLATFORMS**

### **WebAssign:**

All students will need to enroll in the MA 415 course on WebAssign. Enroll in the course by following the instructions found here <https://www.cengage.com/coursepages/uiucmath415fa22>.

### **Piazza Q&A forum:**

If you have questions about anything related to the course, please post them on Piazza rather than emailing me. You will often find if you have a question, then more than likely many people in the class have the same

question.

You may access and register for our class on Piazza at [piazza.com/illinois/fall12022/mat415](https://piazza.com/illinois/fall12022/mat415).

- You may post your questions in the general Q&A tab. Otherwise, post your question in the correct folder. There will be a folder for each HW, numbered as in WebAssign.
- The better you describe your problem, the better (and faster) answers you get. Ideally you want to post all your work and a screen shot of any resource referenced.
- Please do not post anything resembling a solution to a homework problem before it is due.
- Piazza is also a great place to post questions regarding using a particular platform e.g. WebAssign.

All student questions about enrollment switching classes, adding this class, prerequisites, etc. should be directed to Math Advising: [mathadvising@illinois.edu](mailto:mathadvising@illinois.edu).

## CANVAS

The course management will be done through Canvas. Here I will post various announcements regarding the course. You may enroll in the course via the url <https://canvas.illinois.edu/enroll/4EB8AC>.

## Gradescope

The submission and grading of quizzes will be done on Gradescope. To register for the course go to [gradescope.com](https://gradescope.com) and use the entry code *4VGJG7* to register for MA 415. Quizzes will always be due by 11:59pm on the Friday of the week they were assigned. If you do not submit your quiz before then, then you will not be able to submit and will get a 0. As stated above, there will be no make-ups for quizzes.

## AGENDA

The following is a tentative outline of topics covered and is subject to change. If you are absent from class it is your responsibility to find out what material was covered and to obtain notes from classmates.

**Week 1, 22-26 August:** Introduction to linear algebra: Matrices=linear operators. Geometry of linear equations. Gaussian elimination

**Week 2, 29 August-2 September:** Matrix notation and matrix multiplication. Triangle factors and row exchanges. Inverse and Transpose

**Week 3 5-9 September:** Vector spaces and subspaces. The four fundamental subspaces

**Week 4, 12-16 September:** Linear independence, basis and dimension. Review

**Week 5, 19-23 September:** Midterm 1. Linear combinations and linear operators. Orthogonal vectors and subspaces.

**Week 6, 26-30 September:** Cosines and projections onto subspaces. Least squares. Orthogonal bases and Gram-Schmidt

**Week 7, 3-7 October:** Orthogonal bases and Gram-Schmidt. Determinants: properties and formulas

**Week 8, 10-14 October:** Determinants: applications. Introduction to eigenvalues and eigenvectors. Review for Midterm 2

**Week 9, 17-21 October:** Midterm 2. Diagonalization of a matrix. Complex matrices. Similarity transformations

**Week 10, 24-28:** Similarity transformations (Singular value decomposition, polar decomposition)

**Week 11, 31 October-4 November** Positive operators. Matrix limits and Markov chains

**Week 12, 7-11 November** Matrix limits and Markov chains. Review

**Week 13, 14-18 November:** Midterm 3. Intro to quantum information theory

**Week 14, 21-25 November:** Thanksgiving break

**Week 15, 28 November-2 December:** Intro to quantum information theory

**Week 16, 5-9 December:** Review

## COURSE POLICIES

### Academic Integrity Violations

Cheating is not acceptable and will not be tolerated. A more detailed description of the University policy on cheating and plagiarism may be found in the following link: <http://www.las.illinois.edu/students/integrity/>

**DRES Accomodations**

If you are recommended for exam accommodations by DRES, your instructor must be notified and presented with official documentation NO LATER THAN one week before the first exam for which an accommodation is requested. We ask students who received a Letter of Accommodation from DRES, to provide a copy of the accomodations letter to the course instructor. Students are responsible to make the arrangements sufficiently early to ensure availability of proper testing accommodations.

**Attendance**

It is your responsibility to attend class. If you miss or are late to class, contact another student to get the lecture notes. If you miss class or arrive late, check the website (Canvas) or talk to someone else in the class about any important announcements.

**Classroom Decorum**

This is a very large lecture room with many people. The classroom environment should be conducive to learning by all. Please keep chit-chat to a minimum, cell phones turned off, etc. If your behavior is disrespectful to your classmates, you will be asked to leave.