Title of Course: MATH 2550:0101 Engineering Math III: Matrix Algebra

Lecture: 12:30P – 1:20P MW, 113 MLH

Course meeting time and place:

Department of Mathematics: [https://math.uiowa.edu/](https://math.uiowa.edu/)

Course ICON site: To access the course site, log into Iowa Courses Online (ICON) [https://icon.uiowa.edu/index.shtml](https://icon.uiowa.edu/index.shtml) using your Hawk ID and password.

Course Home

The College of Liberal Arts and Sciences (CLAS) is the home of this course, and CLAS governs the add and drop deadlines, the “second-grade only” option (SGO), academic misconduct policies, and other undergraduate policies and procedures. Other UI colleges may have different policies.

Instructor: Raúl E. Curto
Office location: 225H MLH
Office hours: Mon: 10:30 – 11:20 via Zoom; Wed: 10:30 – 11:20 via Zoom; Thu: 11:00 - 11:50 via Zoom; or by appointment.
Phone: (319)467-0303
E-mail: raul-curto@uiowa.edu

TA: None.

Course Coordinator: Raúl Curto, raul-curto@uiowa.edu , 225H MLH, 467-0303

Office Hours: Mon: 10:30 – 11:20; Wed: 10:30 – 11:20; Thu: 11:00 -11:50 (all via Zoom)

DEO: Professor Ryan Kinser, ryan-kinser@uiowa.edu, 14 MLH, 335-0714

Description of Course

Applications, computers for matrix calculations; matrix, vector arithmetic; linear independence, basis, subspace (in R2, R3); systems of equations, matrix reduction; rank, dimension; determinants, applications; eigenvalues, eigenvectors; diagonalization, principal axis theorem.

This course is an abbreviated version of MATH:2700. Here, the emphasis is placed on matrices rather than on both linear transformations and matrices. Particular topics include operations on matrices, the use of matrices in solving systems of linear equations and evaluating determinants, eigenvalues and eigenvectors, the diagonalization of matrices and an introduction to subspaces of Euclidean space. Grades are based on homework, midterms, and a final exam. Although the course is
part of the engineering mathematics sequence, it is not restricted to engineering
students. The course is taught by faculty.

**Learning Objectives**
The objectives of a student taking MATH:2550 are to gain an understanding of basic
concepts and techniques of linear algebra and computation with matrices appropriate to
an engineering curriculum.
The use of matrices in modeling is ubiquitous in the sciences and engineering. An
understanding of the fundamental concepts and techniques of linear algebra involving
vectors and matrices is essential to success in engineering. MATH:2550 is a linear
algebra course that has been streamlined by placing less emphasis on linear
transformations and more emphasis on matrices and matrix calculations. MATH:2550
begins with the study of systems of linear equations and techniques for solving them
using matrix row and column operations. Following this, students will learn basic
algebra and arithmetic operations of matrices, including matrix multiplication, inverses,
and the determinant function. Determinants lead to the next topic, eigenvalues and
eigenvectors, which are very important in a variety of ways for engineers. The course
finishes with the topic of geometry and orthogonality in vector spaces, including a
discussion of quadratic forms and symmetric matrices.

**Textbook/Materials**

*Linear Algebra & Its Applications* by Lay, Lay, and McDonald, 6th Edition with MyLab

We will be teaching this class with electronic content. Your course material is available
on your ICON course site; this is called ICON DIRECT. Please read the additional files
on ICON.

Material to be covered.

**Chapter 1. Linear Equations in Linear Algebra:** Systems of Linear Equations, Row
Reduction and Echelon Forms, Vector Equations, The Matrix Equation $Ax = b$, Solution
Sets of Linear Systems, Linear Independence

**Chapter 2. Matrix Algebra:** Matrix Operations, The Inverse of a Matrix, Characterizations
of Invertible Matrices, Matrix Factorizations, Subspaces of $\mathbb{R}^n$, Dimension and Rank

**Chapter 3. Determinants:** Introduction to Determinants, Properties of Determinants,
Cramer’s Rule, Volume and Linear Transformations

**Chapter 5. Eigenvalues and Eigenvectors:** Eigenvectors and Eigenvalues, The
Characteristic Equation, Diagonalization, Eigenvectors, and Linear Transformations

Chapter 7. Symmetric Matrices and Quadratic Forms: Diagonalization of Symmetric Matrices, Quadratic Forms

**TENTATIVE TIMETABLE (Subject to change, and all changes will be announced in class, posted on the course webpage, or e-mailed to your UI e-mail.)**

- **Week 1**: 1.1
- **Week 2**: 1.2, 1.3
- **Week 3**: 1.4, 1.5
- **Week 4**: 1.7, 2.1
- **Week 5**: 2.2, 2.3,
- **Week 6**: 2.8, Review
- **Exam 1** (Wed of Week 6)
- **Week 7**: 2.9, 3.1
- **Week 8**: 3.2, 3.3
- **Week 9**: 5.1
- **Week 10**: 5.2, 5.3
- **Week 11**: 5.3, Review
- **Exam 2** (Wed of Week 11)
- **Week 12**: 6.1, 6.2
- **Week 13**: 6.3, 6.4
- **Week 14**: 7.1, 7.2
- **Week 15**: 7.2, Review
Academic Honesty and Misconduct
All students in CLAS courses are expected to abide by the CLAS Code of Academic Honesty.

Student Complaints
Students with a complaint about a grade or a related matter should first discuss the situation with the instructor and/or the course supervisor (if applicable), and finally with the Director or Chair of the school, department, or program offering the course.

Undergraduate students should contact CLAS Undergraduate Programs for support when the matter is not resolved at the previous level. Graduate students should contact the CLAS Associate Dean for Graduate Education and Outreach and Engagement when additional support is needed.

Drop Deadline for this Course
You may drop an individual course before the deadline; after this deadline you will need collegiate approval. You can look up the drop deadline for this course here. When you drop a course, a "W" will appear on your transcript. The mark of “W” is a neutral mark that does not affect your GPA. Directions for adding or dropping a course and other registration changes can be found on the Registrar’s website. Undergraduate students can find policies on dropping and withdrawing here.

Grading System and the Use of +/-

With criterion-reference grading, students receive grades based on the quality of their work in relation to the criteria defined by the instructor and by the rubrics or models specifying the qualities of each grade. The cut scores (e.g. 90 for A-) will never go up, but they may go down for some exams, and each exam will be treated separately. We will start with:

Final grades will be awarded based on the following ranges:

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<tr>
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<th>A</th>
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<th>C</th>
<th>D</th>
<th>F</th>
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<tbody>
<tr>
<td>A+</td>
<td>97-100</td>
<td>B+ 87-90</td>
<td>C+ 76-79</td>
<td>D+ 61-64</td>
<td>F &lt; 50</td>
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<tr>
<td>A</td>
<td>93-96</td>
<td>B  83-86</td>
<td>C  71-75</td>
<td>D   56-60</td>
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<tr>
<td>A-</td>
<td>90-92</td>
<td>B- 80-82</td>
<td>C- 65-70</td>
<td>D-  50-55</td>
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Grading System: Plus/minus grading will be used.

50%  2 Evening midterms (see below; the room you need to go to will be announced later)
30%  Final exam (date, time and place to be announced)
10%  Six Online Quizzes, assigned on about every other week. The Quiz with the lowest score will be dropped.
10%  Twelve Online Homework, assigned weekly, and usually due Wednesday at 4:00 pm. The two lowest scores will be dropped.

Attendance and class participation are strongly recommended.

All exams are comprehensive unless specified otherwise.

Midterm Exams
Start and end times: 6:30PM - 8:30PM 02/22/2023 Wed, LR1 VAN
Start and end times: 6:30PM - 8:30PM 04/05/2023 Wed, LR1 VAN

A Word about the Date and Time of the Final Exam: The date and time of every final examination is announced by the Registrar generally by the fifth week of the classes. No exams of any kind are allowed during the last week of classes. All students should plan to be at the UI through the final examination period. Once the Registrar has announced the date, time, and location of each final exam, the complete schedule will be published on the Registrar’s website and will be shared with instructors and students. It is the student’s responsibility to know the date, time, and place of the final exam.

College of Liberal Arts and Sciences (CLAS) Course Policies

Attendance and Absences
University regulations require that students be allowed to make up examinations which have been missed due to illness or other unavoidable circumstances. Students with mandatory religious obligations or UI authorized activities must discuss their absences with me as soon as possible. Religious obligations must be communicated within the first three weeks of classes.

Exam Policies

Communication: UI Email
Students are responsible for all official correspondences sent to their UI email address (uiowa.edu) and must use this address for any communication with instructors or staff in the UI community.
**Calculator Use:** The use of a calculator or any other electronic device in the midterms and final exam is not allowed. When you are doing your HW (to prepare you for your exams), keep in mind that you will not have a calculator in the exams.

**Student Collaboration:** Student collaboration is NOT permitted on the quizzes, midterms, and final exam. Any attempt to collaborate during these exams will result in a score of 0 on that test.

**Late Homework** will not be accepted; however, the two lowest scores will be dropped.

**University Policies**
- [Accommodations for Students with Disabilities](#)
- [Basic Needs and Support for Students](#)
- [Classroom Expectations](#)
- [Exam Make-up Owing to Absence](#)
- [Free Speech and Expression](#)
- [Mental Health](#)
- [Military Service Obligations](#)
- [Non-discrimination](#)
- [Religious Holy Days](#)
- [Sexual Harassment/Misconduct and Supportive Measures](#)
- [Sharing of Class Recordings](#)