MATH 2550

SYLLABUS Spring 2020

The University of Iowa
The College of Liberal Arts and Sciences
Department of Mathematics

Engineering Math III: Matrix Algebra: MATH 2550: 0331

Time & Location for Lecture: 9:30A - 10:20A TTh 101 BCSB

Some of the policies relating to this course (such as the drop deadline) are governed by its administrative home, the College of Liberal Arts and Sciences, 120 Schaeffer Hall.

Prerequisites: MATH:1850 or MATH:1550 or MATH:1860 or MATH:1560 or MPT Level 3 score of 15 or higher.

Approved GE: None.

Instructor: Oguz Durumeric
Office location and hours: 1D MLH; Mon Wed: 1:30-2:30, and Tue Thu: 10:30-11:20
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Website address: http://www.math.uiowa.edu/~odurumer/
Math Department Website address: http://www.math.uiowa.edu/

TA: None
Course Coordinator: Oguz Durumeric, oguz-durumeric@uiowa.edu
Office Hours: Mon Wed: 1:30-2:30
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Office: 1D MLH
DEO Contact Information: Professor Weimin Han,
Weimin-han@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 matrix 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.

Objectives and Goals of the Course:

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 which 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, 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.

Required text:

Linear Algebra & Its Applications by Lay, Lay, and McDonald, 5th Edition with MyLab

We will be teaching this class with electronic content. Your course material is available in your ICON course site, this is called ICON DIRECT. Please read the additional files on ICON:
Student Registration Instructions for MyLab & Modified Mastering with Canvas

You may opt out of this content, but the consequences of doing so may affect your outcomes in this course. You will lose access to any additional content your instructor might add to the eTextbook, such as links to other content; additional supplemental resources; and highlights, annotations, and any study tips your instructor may add to guide your engagement and learning in the course. Without MyLab, you cannot access to the online HW and online quizzes. You risk falling behind in the course if you have not acquired alternate versions of the same materials prior to the first day of the class.

Faculty are not responsible for providing you with alternative materials or waiving course/class requirements.

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 Rn, 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 6. Orthogonality and Least Squares: Inner Product, Length, and Orthogonality, Orthogonal Sets, Orthogonal Projections, The Gram–Schmidt Process

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

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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) The timetable for sections with MW lectures will be slightly different from the sections with TTh lectures due to classes starting on a Tuesday.

Week 1: 1.1, 1.2
Week 2: 1.3, 1.4
Week 3: 1.5, 1.7
Week 4: 2.1, 2.2
Week 5: 2.3, 2.8
Week 6: 2.9; Review
Exam 1
Week 7: 3.1, 3.2
Week 8: 3.3, 5.1
Week 9: 5.1, 5.2
Week 10: 5.3
Week 11: 6.1, Review
Exam 2
Week 12: 6.2
Week 13: 6.3, 6.4
Week 14: 7.1, 7.2
Week 15: 7.2, Review

Grading:

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. We may choose to adjust the scale (criteria) uniformly for all sections if a need arises. 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:

A, A- > 90; B+, B, B- > 80; C+, C, C- > 65; D+, D, D- > 50; F < 50

Grading System: Plus/minus grading will be used.

50% 2 Evening midterms see below, the room you need to go will be announced later.
30% Final exam (date, time and place to be announced)
10% 5 best of 6 Online Quizzes, about every other week
10% 10 best of about 12 Online Homework, assigned weekly,
and usually due Sunday 11:59 pm CST
Attendance and class participation are strongly recommended

All exams are comprehensive, unless specified otherwise.

Midterm Exams
Start and end times: 6:30PM - 8:30PM 03/02/2020 Mon AUD MH / W151 PBB
Start and end times: 6:30PM - 8:30PM 04/13/2020 Mon AUD MH / W151 PBB

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 on being 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 web site 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.

Make-up policy:

We will follow CLAS guidelines strictly. Read all of the information from the link below.

https://clas.uiowa.edu/students/handbook/attendance-absences

As stated in CLAS webpage:

"University policy requires that students be permitted to make up examinations missed because of illness, mandatory religious obligations, authorized UI activities, or unavoidable circumstances. An unavoidable circumstance is defined as an event beyond the student's control and often involves a serious and unexpected hospitalization, a family tragedy, or a related incident. Such circumstances **do not include** attendance at a wedding, a family vacation, obligations related to work or other such matters. The instructor of a student participating in an authorized UI activity is sent a statement generally by email from the UI official in charge of the event before the absence occurs; this statement will include the specific date and time that the student will miss class. Activities related to employment, fraternities or sororities, or volunteer activities are not UI authorized activities."

Calculator Use: The use of a calculator or any other electronic device in the quizzes, midterms and final exam. When you are doing your HW (to prepare you for your exams), keep in mind that you will not have 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 0 score on that test.

Other Course Policies:

Students are expected to attend all lectures, and do all of the homework regularly. Students are responsible for everything covered in the lectures, textbook and the prerequisites. Important announcements about changes (if necessary) to the syllabus, homework, exams, etc. will be done in the lectures or they will be sent via ICON.

There will be quizzes almost every other week (excluding the weeks of the exams), consisting of problems similar to those assigned as homework. Taking all quizzes and all exams (midterms and final) is mandatory. In the exams, you may be asked to show all of your work in an organized and coherent fashion for some questions. In the long problems, all work must be shown, and giving only a final solution obtained by guessing or using a calculator may not earn full credit. Make-ups may be given for the exams missed due to unavoidable circumstances and compelling reasons which are documented in writing. If you have a conflict or a medical reason, discuss your situation with your lecturer as soon as possible.

You are strongly encouraged to go to your lecturer's office hours. Make an appointment, if you have a conflict with the listed office hours.

Cell phones must be turned off during the lectures and exams. If you have to read or text a message during the lecture, please do it outside the classroom. During the exams, the cell phones are required to be put (far) away, preferably at the bottom of your backpack. During the exams, you cannot hold them in your hand, not keep them on your desk, chair, or anywhere easily accessible, and you cannot use it as a calculator. This applies to all electronic devices which can communicate or connect online.

Resources for Students:

Math Tutorial Lab: 125 MLH http://www.math.uiowa.edu/math-tutorial-lab
Students will find the Writing Center and the Speaking Center very useful for this course:
Writing Center: http://www.uiowa.edu/~writingc/
Speaking Center: http://clas.uiowa.edu/rhetoric/for-students/speaking-center

Notes to the Students:

1. All students in the College have specific rights and responsibilities. You have the right to adjudication of any complaints you have about classroom activities or instructor actions. Information on these procedures and your responsibilities is available in the Schedule of Courses and on-line in the College's Student Academic Handbook, (https://clas.uiowa.edu/students/handbook) In summary, first see the person you wish to complain about, and then see his/her immediate supervisor. The chain is: graduate or undergraduate assistants, then the lecturer of your course, then the course coordinator, then the Chairman of the Department of Mathematics Professor Weimin Han, and then an appropriate Dean. The Department of Mathematics has offices in 14 MLH (MacLean Hall). To make an appointment to talk to the chairman of the department call 335-0714 or contact the departmental secretary in 14 MLH.

2. We would like to hear from anyone who has a disability which may require some modification of seating, testing, or other class requirements so that appropriate arrangements may be made. Please contact your lecturer during his office hours, in the **beginning of the semester and far in advance of the exams**. You should notify the Office of Student Disability Services, SDS and obtain the need forms. The necessary modifications will be made available to you after the SDS processes and approves your request.
3. We are planning to use ICON for posting grades and other course material. Also, some announcements may be e-mailed through ICON to your UI e-mail. Check ICON and your UI e-mail regularly, and make sure that UI has your correct e-mail address.
4. This course plan may be modified during the semester. All changes will be announced in class in advance. It is solely the student's responsibility to be informed of such announced changes.

Teaching Policies & Resources — Syllabus Insert

College of Liberal Arts and Sciences
Information for Undergraduates

Absences and Attendance

Students are responsible for attending class and for contributing to the learning environment of a course. Students are also responsible for knowing their course absence policies, which will vary by instructor. All absence policies, however, must uphold the UI policy related to student illness, mandatory religious obligations, including Holy Day obligations, unavoidable circumstances, or University authorized activities (https://clas.uiowa.edu/students/handbook/attendance-absences). Students may use this absence form to aid communication; the instructor will decide if the absence is excused or unexcused (https://clas.uiowa.edu/sites/default/files/ABSENCE%20EXPLANATION%20FORM2019.pdf).

Academic Integrity

All undergraduates enrolled in courses offered by CLAS have, in essence, agreed to the College's Code of Academic Honesty. Misconduct is reported to the College, resulting in suspension or other sanctions, with sanctions communicated with the student through the UI email address (https://clas.uiowa.edu/students/handbook/academic-fraud-honor-code).

Accommodations for Disabilities

UI is committed to an educational experience that is accessible to all students. A student may request academic accommodations for a disability (such as mental health, attention, learning, vision, and physical or health-related condition) by registering with Student Disability Services

(SDS). The student is then responsible for discussing specific accommodations with the instructor. More information is at https://sds.studentlife.uiowa.edu/.

Administrative Home of the Course

The College of Liberal Arts and Sciences (CLAS) is the administrative home of this course and governs its add/drop deadlines, the second-grade-only option, and related policies. Other colleges may have different policies. CLAS policies may be found here: https://clas.uiowa.edu/students/handbook.

Communication and the Required Use of UI Email

Students are responsible for official correspondences sent to the UI email address (uiowa.edu) and must use this address for all communication within UI (Operations Manual, III.15.2).

Complaints

Students with a complaint about an academic issue should first visit with the instructor or course supervisor and then with the Chair of the department or program offering the course; students may next bring the issue to the College of Liberal Arts and Sciences. For more information, see https://clas.uiowa.edu/students/handbook/student-rights-responsibilities.

Final Examination Policies

The final exam schedule is announced around the fifth week of classes; students are responsible for knowing the date, time, and place of a final exam. Students should not make travel plans until knowing this information. No exams of any kind are allowed the week before finals. Visit https://registrar.uiowa.edu/final-examination-scheduling-policies.

Nondiscrimination in the Classroom

UI is committed to making the classroom a respectful and inclusive space for all people irrespective of their gender, sexual, racial, religious or other identities. Toward this goal, students are invited to optionally share their preferred names and pronouns with their instructors and classmates. The University of Iowa prohibits discrimination and harassment against individuals on the basis of race, class, gender, sexual orientation, national origin, and other identity categories set forth in the University's Human Rights policy. For more information, contact the Office of Equal Opportunity and Diversity (diversity.uiowa.edu).

Sexual Harassment

Sexual harassment subverts the mission of the University and threatens the well-being of students, faculty, and staff. All members of the UI community must uphold the UI mission and contribute to a safe environment that enhances learning. Incidents of sexual harassment must be reported immediately. For assistance, please see https://osmrc.uiowa.edu/.