Introduction to Linear Algebra
MTH 236-001, Spring 2024
Sugar Grove Campus, BDE 244
MW 9:30am-11:10am

Instructor Contact Information and Availability

Name and Title:	Dr. Steve Kifowit, Assistant Professor (Pronouns: He/Him/His)
Waubonsee Email:	skifowit@waubonsee.edu
Office Location:	Sugar Grove Campus, BDE 249
Office Hours:	MW 11:30am-12:30pm TTh 11:30am-1:00pm Other office (or Zoom) hours are available by appointment.
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Preferred Contact Method:	Email or in-person
Response Time:	During weekdays, please allow for up to 24 hours for email response.

Course Description

This course covers basic concepts and techniques of matrix theory and linear algebra. It includes systems of linear equations, operations with matrices, inverses, determinants, vector spaces, inner product spaces, linear transformations, eigenvalues and eigenvectors. Numerical iterative methods are discussed and formal proof constructions are stressed.

Prerequisite(s)

MTH 233 (Calculus III) with a C or better

Illinois Articulation Initiative (IAI) Codes

MTH 911

Course Materials

Textbook (required)

Heffron, Jim (2021). *Linear Algebra* (4th ed.). Self-published, http://heffron.net/linearalgebra.

Disclaimer: This course syllabus and schedule are subject to change. Updates and other revisions to course policies will be communicated via college (waubonsee.edu) email.

Class Materials and Resources

The TI-83/84 Graphing Calculator is required for the course.

Important Class Notes

Recommended Corequisite: None
Course Delivery Mode: Face-to-face
Credit Hours: 4.0

Course Objectives

Throughout this course, the student will learn to:

1. solve systems of linear equations,
2. perform matrix operations,
3. compute inverse of a matrix,
4. compute determinant of a matrix,
5. calculate the basis and dimension of a vector space,
6. calculate the rank of a matrix,
7. apply Gram-Schmidt process to find orthonormal basis,
8. solve the least squares problem,
9. compute the kernel and range of a transformation,
10. compute the eigenvalues and eigenvectors,
11. apply the Jacobi and Gauss-Seidel numerical methods,
12. solve real world applications of concepts, and
13. construct proofs for theoretical findings in the course.

Student Learning Outcomes

Course Learning Outcomes

Upon successful completion of this course, the student will be able to:

1. solve systems of equations using matrix operations, inverses, or determinants;
2. prove mathematical statements using valid logical arguments to study vector spaces, inner product spaces, linear transformations, eigenvalues and eigenvectors.

College Learning Outcomes

This course contributes to the following college learning outcomes:

☒ Critical Thinking
Examine information in order to propose or develop solutions or construct arguments.

☐ Communication
Use clear language to communicate meaning appropriate to various contexts and audiences.

☐ Quantitative Literacy
Make judgments or draw appropriate conclusions based on the quantitative analysis of data.

☐ Global Awareness
Describe the interconnectedness of issues, trends or systems using diverse perspectives.

☐ Information Literacy
Use technology to ethically research, evaluate or create information.

Methods of Evaluation of Student Learning, Grading Criteria, and Scale

Your performance in this course will be evaluated based on the following components:

Grading Criteria

Total points: 500

Grading Components	Score	Quantity	Subtotal	Percent
Tests	100	3	300 points	60%
Homework Assignments	10	10	100 points	20%
Comprehensive Final Exam	100	1	100 points	20%

Grading Scale

A ≥ 89.50% B ≥ 79.50% C ≥ 69.50% D ≥ 59.50% F < 59.50%

You can estimate your current grade at any time during the semester by computing the following percentage: 100% * (Total points accumulated) / (Total points possible). Please feel free to discuss your grade at any time during the semester. Throughout the semester, current grades will be available in our Canvas course shell.

Attendance, late work, and make-up policy

Regular class attendance is an essential component of successful learning. Students are responsible for prompt attendance and participation in all class meetings. If you miss class, you will not be allowed to make up any tests, quizzes, or assignments that you may have missed (**but you may reschedule a test or submit an assignment in advance of a missed class period**). All material covered in class is the student's responsibility.

Description and Details of Assignments

Practice Problems & Reading Assignments

Practice problems from the textbook will be suggested daily and posted to the class website. Practice problems will not be collected for grading, but they should be considered mandatory. It is important that you keep up to date with the problems. These problems will prepare you for the

tests and weekly assignments. Also on a daily basis, you will be asked to read and work through certain sections of the textbook.

Homework Assignments

Each week, you will be given a 10-point homework assignment. The assignments will typically include 8-12 problems, several of which (but not all) will be randomly selected for grading. Homework problems will be similar to class examples and textbook practice problems. Homework assignments will be due on Wednesdays, unless otherwise indicated. **Late homework will not be accepted unless the late submission is discussed and scheduled in advance with your instructor.** At the end of the semester, only your top ten (10) homework scores will count toward your overall grade.

Tests

Test problems will be similar to class examples, textbook problems, and homework problems. In addition to computational problems and proofs, tests may include multiple choice, true/false, short answer, and/or writing problems. **You must show all work (showing how you got your answer) on all tests to receive full credit.** You must work individually on all tests. No make-up tests will be given (unless scheduled prior to the test). At the end of the semester, your lowest test score will be replaced by your final exam score (if this helps you).

Final Exam

The final exam is comprehensive and will be worth 100 points toward your final grade. **The final exam is NOT optional.** The final exam is scheduled for our last class period, Wednesday, May 8.

Calculators

The TI-83/84 graphing calculator is required for this course. There are graphing calculator emulators available for smart phones and tablets--you may you these during class periods, but not during tests. If you would like to use a graphing calculator other than the TI-83/84, please discuss your options with your instructor. We will often require more computational power than our hand-held calculators offer. In these cases, we will use SageMath (https://www.sagemath.org/) or Octave (https://www.octave.org/).

Phones/Tablets/Laptops

Electronic devices may be used for taking notes and computing during lectures, but they may not be used on in-class tests. These devices must be silenced and put away during tests. Students in special circumstances who require their phones to be readily available must discuss their situations with the instructor.

Institutional Policy

Withdrawal

Waubonsee Community College reserves the right to administratively withdraw students who are not actively attending. Students may withdraw themselves from this course until the date noted on the Tuition Refunds page.

*** Please see the Student Handbook for other course policies and procedures.

Institutional Statements

Academic Integrity

Waubonsee Community College believes that all members of the community (students, faculty, staff, and administrators) have a responsibility to participate in learning with honesty, respect, and integrity. We must commit to engage in learning both in and out of the classroom, value each member in our learning community, demonstrate original thought, and help foster ethical, open, safe learning environments for all. For more information, please see the Waubonsee Community College Plagiarism Statement section in the Student Handbook.

Accessibility and Disability Statement

Accessibility is a value of our institution. We are committed to creating environments that are welcoming and that support all students' learning. If you experience barriers to your learning in this course please notify the instructor as soon as possible to discuss options. Students who experience barriers due to disability may contact the Access Center for Disability Resources to begin this conversation or establish accommodations.

Plagiarism

Waubonsee firmly upholds sound principles of academic integrity and responsibility. Plagiarism and cheating are serious infractions of academic integrity, and, as such, are considered breaches of the Code of Student Conduct. If a student has violated this policy, I will report the infraction to the Dean for Student Success and Retention and the student may fail the assignment or the course, depending on the severity or the number of infractions.

Student Support Services and Resources

Waubonsee Community College is committed to your success, and has many free supports, services, and resources available to you. Please visit the Waubonsee Cares page for links to basic needs (food, shelter, safety, etc.) support and resources both on campus and in the community. Please see the Student Experience page for more information and to get connected with Academic Support, Career Development, Counseling and Advising, Disability Resources, Student Life, Student Services, Technical Assistance Center, the Veterans Program, and many more! If you're not sure what type of assistance you need, please talk to me and I will help get you connected.

Course Schedule

Week (Date)	Textbook Sections	Topics & Assignments
Week 1 Jan 17	Chapter One, Section I	Linear systems, Elimination, Row echelon form, General and particular solutions
Week 2 Jan 22 & Jan 24	Chapter One, Section III	Reduced row echelon form, Gauss-Jordan elimination (HW due on 1/24)
Week 3 Jan 29 & Jan 31	Chapter Two, Section I	Vector spaces, Subspaces (HW due on 1/31)
Week 4 Feb 5 & Feb 7	Chapter Two, Section II **Test 1 on Wed, Feb 7**	Linear independence, Test 1 covers Weeks 1-3 (HW due on 2/7)
Week 5 Feb 12 & Feb 14	Chapter Two, Section III	Basis and dimension
Week 6 Feb 19 & Feb 21	Chapter Three, Sections I & II	Isomorphisms, Homorphisms (HW due on 2/21)
Week 7 Feb 26 & Feb 28	Chapter Three, Section III	Linear transformations and matrices (HW due on 2/28)
Week 8 Mar 4 & Mar 6	Chapter Three, Section IV **Test 2 on Wed, Mar 6**	Matrix operations, Test 2 covers Weeks 4-7 (HW due on 3/6)
Break Mar 11 & Mar 13	**Spring Break**	No classes.
Week 9 Mar 18 & Mar 20	Chapter Three, Sections IV & V	Elementary matrices, LU factorization, Change of basis (Take-home portion of test due 3/18)
Week 10 Mar 25 & Mar 27	Chapter Three, Section VI	Projections, Gram-Schmidt process (HW due on 3/27)
Week 11 Apr 1 & Apr 3	Chapter Four, Sections I & III	Determinants, Laplace expansion, Cramer's rule (HW due on 4/3)
Week 12 Apr 8 & Apr 10	Catch-up/Review **Test 3 on Wed, Apr 10**	Test 3 covers Weeks 8-11 (HW due on 4/10)
Week 13 Apr 15 & Apr 17	Chapter Five, Sections I & II	Similarity, Eigenvalues & vectors
Week 14 Apr 22 & Apr 24	Chapter Five, Section II	Eigenvalues & vectors, Diagonalizability (HW due on 4/24)
Week 15 Apr 29 & May 1	Supplemental notes (as well as Chapter One, Section II)	Inner product spaces, Least squares (HW due on 5/1)
Week 16 May 6 & May 8	Review, **Final Exam on Wednesday, May 8**	Final exam is comprehensive.

April 12 is the last day for students to withdraw themselves. Please check the current Waubonsee Academic Calendar for important dates.

Class Website

Course information, including tests, homework assignments, and answer keys, can be found on the class website at http://stevekifowit.com/classes/m236.htm.

Grades, announcements, and Zoom meeting information will be posted in our Canvas course shell. Other course information will be available on the class website.

Change of Delivery Mode

In the event that we must discontinue our face-to-face class meetings, we will automatically transition to synchronous Zoom meetings at our scheduled days and times. In such a case, Zoom meeting information will be in our Canvas Course shell. Office hours will probably transition to Zoom as well---check for announcements to be sure.