

MAT 272 - 01 : Introduction to Linear Algebra
MR 12:30 pm to 1:45 pm in WH 231
Credits: 3 Credits
Grading: Standard A-F Grading
Prerequisite: Calculus II or Equivalent

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Office Hours:

- MTRF: 11:00 am to 12:00 pm
- M: 2:00 pm to 3:00 pm
- or by appointment

Course Materials:

- Text: Linear Algebra, 3rd edition, by Jim Hefferon
(Available for free at <http://joshua.smcvt.edu/linearalgebra/>)

Course Description:

Topics will be selected from: Systems of Linear Equations, Vector Spaces, Basic Operation for Matrices, Determinants, Bilinear and Quadratic Functions and Forms, Linear Transformations on a Vector Space, and others.

Course Outcomes:

After successful completion of this course a student will be able to demonstrate:

- familiarity with the principle definitions and theorems of linear algebra;
- facility with basic matrix and vector operations;
- an ability to calculate solutions to systems of linear equations;
- an ability to find determinants, eigenvectors, and eigenvalues for matrices;
- knowledge of vector spaces and bases;
- knowledge of some basic applications of linear algebra.

Course Content:

Chapter 1: Linear Systems
Sections I - III

Chapter 2: Vector Spaces
Sections I, II. II.1-III.3

Chapter 3: Linear Transformations
Sections I - VI, and Line of Best Fit

Chapters 4 and 5: Determinants, Eigenvalues, and Eigenvectors
Sections 4.I, 4.II, and 5.II

Course Calendar:

THURSDAY	MONDAY
8/30 Syl., Intro., & Geometric Introduction to Vectors and Matrix Operations	9/3 Labor Day - No Classes
9/6 Chapter 1: Linear Systems	9/10 Gauss's Method/Row Reduction
9/13 Gauss's Method/Row Reduction Continued	9/17 Vectors in Space
9/20 Vectors and Systems	9/24 Chapter 1 Exam
9/27 Chapter 2: Vector Spaces	10/1 Subspaces and Spanning Sets
10/4 Independence and Bases	10/8 Vector Spaces and Linear Systems
10/11 Chapter 2 Exam	10/15 Vectors and Matrices in Sage
10/18 Chapter 3: Linear Transformations	10/22 Transformations and Matrices
10/25 Homomorphisms and Isomorphisms	10/29 Changing Bases
11/1 Orthogonal Projections	11/5 Curve of Best Fit
11/8 Chapter 3 Exam	11/12 Chapters 4 and 5: Determinants, Eigenvalues, and Eigenvectors
11/15 Determinants and Their Properties	11/19 Geometry of Determinants
11/22 Thanksgiving Recess - No Classes	11/26 Similar Matrices and Diagonalizability
11/29 Eigenvalues and Eigenvectors	12/3 Chapter 4 and 5 Exam
12/6 Final Exam Review	12/10

Grading:

Text Assignments	40%
Chapter Exams	48% (12% each)
Final Exam (12/13/18 at 11am)	12%
Extra Credit	5%

Text Assignments:

For each unit you will be given a set of skill, application, and theory problems from the text. You may work on these in groups of up to three students, but if you do then you must only hand in one copy of the assignment per group. Assignments must also adhere to all the assignment guidelines listed below.

Chapter Exams:

You will have a full period exam for each chapter. In class exams will focus on basic definitions and skills. For each exam you will have a

- Practice Exam (5% of the exam grade) due when you come in to take the exam,
- In Class Exam (90% of the exam grade), and
- Exam Redos (5% of the exam grade) due the class period after I hand back the exam.

In addition to the practice exam and the redos each accounting for 5% of your grade, if you do well on them, then you can earn back up to 30% of the points you lost on the in class portion.

Final Exam:

The final exam, like the chapter exams, will focus on definitions and skills. You will get a practice exam which counts for 10% of your final exam grade and can earn you back 30% of your missed points on the in class portion of the exam.

Extra Credit:

Throughout the semester you will have opportunities to earn extra credit toward your final grade. The most basic form of extra credit will be exercises from the text which can add up to 0.5% toward your final grade. You can also earn up to 1% toward your final grade by volunteering to take class notes for a day. To be the note taker for the day you need to let me know ahead of time that you wish to do so, then after class you need to type up your notes so that I can post them for the rest of the class. You can only earn a total of 5% extra toward your final grade.

Departmental Course Outline:

1. Vectors
 - (a) Geometric View in \mathbb{R}^2 and \mathbb{R}^3
 - (b) Operations in \mathbb{R}^n
 - (c) Orthogonality
 - (d) Projections
2. Systems of Linear Equations
 - (a) Algebraic Solutions
 - (b) Geometric View of Solutions
 - (c) Gaussian Elimination
 - (d) Homogeneous Systems
 - (e) Non-Homogeneous Solutions
3. Matrices
 - (a) Operations for $m \times n$ Matrices
 - (b) Properties of Matrices
 - (c) Inverse Matrices
 - (d) Determinants of Matrices
4. Real Vector Spaces
 - (a) Properties and Special Examples
 - (b) Subspaces
 - (c) Independence, Bases, and Dimension
 - (d) Change of Basis
 - (e) Inner Product Spaces
 - (f) Orthonormal Sets
5. Linear Transformations
 - (a) Properties and Examples
 - (b) Matrix Representations
 - (c) Transformations and Change of Basis
 - (d) Kernel and Range
6. Special Topics
 - (a) Eigenvalues and Eigenvectors
 - (b) Symmetric Matrices
 - (c) Diagonalizable Matrices
 - (d) Quadratic Matrices
7. Applications
 - (a) Polynomial Curve Fitting
 - (b) Markov Chains
 - (c) Error-Correcting Codes
 - (d) Leontief Economic Model
 - (e) Kirchhoff's Laws

The content in this course addresses the “Expertise in Content Knowledge” portion of the WCSU Education Program Conceptual Framework. When you have successfully completed this course you will have added to the body of knowledge necessary to teach mathematics in Connecticut public schools.

You and Your Grades:

- “A” (Exceptional) range 90% to 100%:
The student has demonstrated significant mastery of the appropriate knowledge and skills relevant to the course. The student is able to solve standard formulaic exercises and most nonstandard problems which require deeper insight.
 - “A” $\iff 92.5\% \leq \text{Grade} \leq 100\%$
 - “A-” $\iff 90\% \leq \text{Grade} < 92.5\%$
- “B” (Good) range 80% to 90%:
The student has demonstrated mastery of the appropriate knowledge and skills relevant to the course. The student is able to solve standard formulaic exercises and some nonstandard problems which require deeper insight.
 - “B+” $\iff 87.5\% \leq \text{Grade} < 90\%$
 - “B” $\iff 82.5\% \leq \text{Grade} < 87.5\%$
 - “B-” $\iff 80\% \leq \text{Grade} < 82.5\%$
- “C” (Adequate) range 70% to 80%:
The student has demonstrated adequate mastery of the appropriate knowledge and skills relevant to the course. The student is able to solve most standard formulaic exercises but struggles with nonstandard problems which require deeper insight.
 - “C+” $\iff 77.5\% \leq \text{Grade} < 80\%$
 - “C” $\iff 72.5\% \leq \text{Grade} < 77.5\%$
 - “C-” $\iff 70\% \leq \text{Grade} < 72.5\%$
- “D” (Inadequate) range 60% to 70%:
The student has demonstrated inadequate or incomplete mastery of the appropriate knowledge and skills relevant to the course. The student is able to solve some standard formulaic exercises but few if any nonstandard problems which require deeper insight.
 - “D+” $\iff 67.5\% \leq \text{Grade} < 70\%$
 - “D” $\iff 62.5\% \leq \text{Grade} < 67.5\%$
 - “D-” $\iff 60\% \leq \text{Grade} < 62.5\%$
- “F” (Unacceptable) below 60%:
The student has demonstrated essentially no mastery of the appropriate knowledge and skills relevant to the course. The student is unable to solve most standard formulaic exercises and essentially no nonstandard problems which require deeper insight.

End User Agreement:

General Expectations: As a student in this class you are expected to:

- show up for every class on time, prepared to learn,
- actively participate in class,
- take notes in class,
- review your notes on a regular basis,
- check your university email every day,
- check the class website at least every other day, (<http://sites.wcsu.edu/roccac>)
- begin studying for exams in a timely fashion,
- ask questions in class,
- attend office hours,
- seek help in the math tutoring clinic, and
- complete assignments and readings on time.

Assignment Guidelines: (These apply to all out of class work.)

- Out of class assignments should always look neat, legible, and professional; they must be written on loose leaf college ruled paper or be typed.
- Messy work, work on crumpled papers, or on paper torn from a notebook will be rejected and counted as late.
- Whenever appropriate, answers on all assignments should be given in complete sentences. I should be able to tell what your answer means without re-reading the problem.
- An assignment is considered late after I have handed it back or gone over it in class. Late assignments are accepted but will receive at most 75% credit. Also, late assignments go to the absolute bottom of the stack of papers to be graded, all on time work is graded first.
- If you work on an assignment as part of a group, then there may be no more than three individuals in the group and you must hand in only one copy of the assignment with all your names on it; if you hand in multiple copies, I will deduct points.

Exam Makeup Policy: To qualify for a makeup exam you must have a valid reason for missing the exam and, if at all possible, let me know ahead of time that you are missing the exam. You will need to show up for class in person in order to arrange a time for the make up exam. If you do not have a valid reason, do not give prior notice when possible, or simply do not show up for an exam, you are not entitled to a makeup and will not be given one. If you fail to show up for your makeup exam, you will not be given a second opportunity.

The 2% Exception: Any assignment, quiz, or other piece of work which is ultimately worth no more than 2% of your final grade can not be made up or turned in late.

Time on Task: For all your classes you should be spending at least 2 hours working outside of the class for every 1 hour in the class. In particular for this class you should be doing 6 hours of work a week not including class time. Note that this is an average, if you are weak in the subject or under prepared you will need to spend more time on the class.

Attendance: There is no specific policy for attendance in this course. However please keep the following in mind:

- if you have three consecutive unexcused absences within the first half of the semester I am required to report to the University that you have stopped attending,
- some assignments may be started, if not completed, in class, and
- while most of the dates and assignments for the course will be posted on the website occasionally small assignments or quizzes may only be announced in class.

Also, if you come in late after I have taken attendance, then *you* are responsible for emailing me to let me know you were in class.

Devices: If you wish to have an electronic device in class to help with learning the material, recording notes, or recording lectures that is fine. Please make an attempt to be polite and professional, do not use your device for personal reasons during class; that is the sort of behavior that can ruin things for everyone.

Academic Honesty: If on any assignment, quiz, or exam you turn in someone else's work as if it were your own you will receive a zero on that assignment, quiz, or exam. If you are caught doing this three times you will receive an F in the course and the Dean will be informed of your academic dishonesty.

(WCSU Honesty Policy: <http://www.wcsu.edu/facultystaff/handbook/forms/honesty-policy.pdf>)

Accommodations: If you have need of an accommodation for testing or note taking, please visit AccessAbility Services, located in White Hall 005 (<http://www.wcsu.edu/accessability>). They will give you an accommodation letter which you must bring to me as soon as possible.