Elementary Computational Linear Algebra

CSCI 2033 (70 & 71) - 4 Credits

Century College - Summer 2023

Instructor

Matthew Sanders   Email: Matthew.Sanders@century.edu (preferred)
  Office Phone: 651.779.3490
  Office Room: Virtual (Normally W3076)
  Office Hours:
    (zoom / email) Monday-Friday 3pm-4:30pm
Other meeting times can be scheduled via email as needed. Email response times should be less than 48 hours, but likely faster.

Description

This course is an introduction to the numerical methods of Linear Algebra and their application to solving computational problems. Topics covered will include matrices, linear transformations, linear vector spaces, inner produt spaces, systems of linear equations, Eigenvalues, and singular values. Algorithms and computational matrix methods will be presented using MATLAB. Matrix methods will be used to solve a variety of computer science problems.

Modality

The course will be taught in an asynchronous-online manner.

Prerequisites

One of the following: CSCI 1058, CSCI 1060, CSCI 1071, CSCI 1081, CSCI 1082, or instructor consent

Course Objectives

- Vectors; linear combinations; matrices; matrix operations
- Elementary linear mappings; applications in graphics and statistics
- Systems of linear equations
- Theory of linear equations; complexity, operation counts
- Vector spaces; abstract linear spaces; subspaces; linear dependence basis and dimensions; row reduced form; null space; range
- Determinants Theory; Proofs
- Inner Products; Orthogonality; Least Squares; Norms, Condition Numbers, and Numerical Stability
- Abstract linear transformations
- Eigenvalues, Spectra of Symmetric matrices; Diagonalization of symmetric matrices
- Singular Value Decomposition

Learning Outcomes

- demonstrate an understanding of the basic theorems and techniques of linear algebra
- develop the numerical methods which approximate linear algebraic equations
- create and apply appropriate algorithms and numerical methods to solve a variety of problems
- use Matlab (or similar tool) to implement algorithms and computational methods
- use symbolic methods to identify and solve linear algebraic problems

Textbook

Applied Linear Algebra 2e by Peter J. Olver and Chehrzad Shakiban *ISBN-13: 978-3319910406*

Course Policies

- Students should always seek help from the instructor (or tutor if available) when they are confused and can not solve a problem themselves. I do not want you to fall behind or turn in half-finished materials just because you were confused and didn't reach out for help.

- All materials will be turned in through D2L. All materials must be turned in by the due date listed for that material on D2L.

- It is your responsibility to check the course checklist and homepage on D2L for announcements, news, and due dates.

- Make sure to use your Century College e-mail to send instructor e-mails, as the e-mail system here will often block mail with personal e-mail addresses. Also, please make sure to put the course name and a description of your email in the subject line of any e-mail you send me. Example: "CSCI 2033 Assignment 1".

- Cheating will not be tolerated on examinations or homework. Revealing or discussing test questions or homework solutions with students who have not yet completed them is considered cheating. Using homework solutions found online or AI generated answers is considered cheating. Any student caught cheating will be dropped from the class with an automatic F.

- For any comments, complaints, or recommendations about the class please see me privately

Assignments & Labs

Assignments and labs must be turned in via D2L, and may be implemented in Drop-Box and Quiz formats. Explanations will be included on the D2L checklists.

Tentative Schedule

A detailed list of all materials for the course, and their recommended due dates can be found in the D2L Checklist. Below is a calendar listing of the topics and their anticipated dates of discussion

Week	Chapter
5/22-5/28	Chapter 1
5/29-6/4	Chapter 1
6/5-6/11	Chapter 2
6/12-6/18	Chapter 3
6/19-6/25	Chapter 4
6/26-7/2	Chapter 5
7/3-7/9	Chapter 7
7/10-7/16	Chapter 8

Grading

Graded materials will include assignments, labs, quizzes, and a final exam.

30% - Final Exam

30% - Tests

40% - Assignments & Labs

Grading Scale

Grades will be truncated to an integer at the end of the semester

Cumulative Score	Grade
90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
0 - 59	F

College Resources

https://www.century.edu/support-services/academic-support/

- Online Tutor - 24/7 free tutoring through tutor.com

- Peer Tutors - Peer Tutors are available in a variety of disciplines to all Century College students. (West Campus, Room 2460)

- Disability Services / Access Center - Assists students with reasonable accommodations to support their college success. (West Campus, Room 2440

College Policies

Academic Integrity

Academic honesty and integrity are integral to the academic process. Academic dishonesty is a serious offense which undermines the educational process and the learning experience for the entire College community. It is expected that Century College students will understand the standards of academic integrity and adhere to the standards set forth by the College's Academic Honesty Policy and assume responsibility for his/her work and that submitted materials represent the students' own efforts. Any act of academic dishonesty attempted by a student at Century College is unacceptable and will not be tolerated. The 3.6.2 Academic Honesty Procedure is available online.

Accessibility

The Access Center Disability Services office provides services designed to give students with disabilities equal opportunities to participate at Century College. Disabilities include but are not limited to mental health conditions, ADHD, learning disabilities, chronic health conditions, physical disabilities, or sensory disabilities. If you have or think you may have a disability that affects your academic performance, you are encouraged to contact the Access Center Disability Services office to discuss accommodations and services. Documentation must be provided within the first semester of service. If you are already registered with the Access Center, you will need to contact them each semester to have your instructors notified of your accommodations. Location: W2440. Phone: 651-773-1745.

Sexual Harassment and Title IX

Century College aims to promote and protect the personal dignity and well-being of every member of our community. Sexual harassment, sexual assault and other forms of sexual misconduct are antithetical to the commitment, and they constitute unlawful sex discrimination. All forms of sexual misconduct are prohibited by Century College. If you have experienced sexual harassment/assault/misconduct based upon gender/sex/sexual orientation, please report online. You can also contact the Title IX Coordinator, Jenn Rassett at jennifer.rassett@century.edu or (651) 747-4015. For more information, visit our website.

Pregnancy & Related Conditions

Century College does not discriminate against any student on the basis of pregnancy or related conditions. Absences due to medical conditions relating to pregnancy will be excused for as long as deemed medically necessary by a student's medical doctor. Students will be given the opportunity to make up missed work. Students needing accommodations can seek assistance with accommodations from the with pregnancy please contact your instructor or Jenn Rassett, Title IX Coordinator. For more information, visit our website.

Statement of Nondiscrimination and Equal Opportunity:

Minnesota State Colleges and Universities is committed to a policy of nondiscrimination in employment and education opportunity. No person shall be discriminated against in the terms and conditions of employment, personnel practices, or access to and participation in, programs, services, and activities with regard to race, sex, color, creed, religion, age, national origin, disability, marital status, status with regard to public assistance, sexual orientation, gender identity or gender expression. In addition, discrimination in employment based on membership or activity in a local commission as defined by law is prohibited.

Compliance Report

In compliance with The Higher Education Opportunity Act of 2008, institutional and consumer information is made available at Student Right-to-Know. Examples include FERPA, Equity in Athletics, Drug and Alcohol Policy and student outcomes. Land Acknowledgment We acknowledge that the land on which we live and gather is the homeland of the Očhéthi Šakówiŋ (oh-chey-tee shah-koh-ween) and Wahpekute (wah-puh-koo-tee) people of the Dakota Nation, who have lived here for thousands of years. In 1851, under threat of force, the Dakota signed the Treaty of Traverse des Sioux, which ceded land in Mni Sota Makoce (Minnesota) to the US government in exchange for the promise of approximately $3 million, which was never paid. Although the State of Minnesota and the United States Government committed genocide and forced removal in order to acquire land, Indigenous people remain here, making innumerable contributions to our region. We hope that this land acknowledgment statement will inspire others to stand in solidarity with Native nations.