



CAMOSUN COLLEGE
School of Arts & Science
Department of Mathematics & Statistics

MATH-125-D01
Introduction to Linear Algebra
Winter 2021

COURSE OUTLINE

The course description is online @ <http://camosun.ca/learn/calendar/current/web/math.html>

1. Instructor Information

(a) Instructor	Laura Shepherd
(b) Office hours	By Email: Monday – Friday 10:30 am – 11:20 am
(c) Location	N/A
(d) Phone	N/A
(e) E-mail	shepherd@camosun.bc.ca
(f) Website	https://online.camosun.ca/d2l/home

2. Intended Learning Outcomes

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

1. Perform vector operations and use vectors to write parametric equations for lines and planes.
2. Use the dot product to find projections and to find angles between vectors.
3. Solve linear systems using row reduction.
4. Perform matrix operations and give examples of matrices with specific properties.
5. Determine if a transformation is a linear transformation and find the standard matrix for a linear transformation.
6. Find the inverse of an invertible matrix and use it to solve matrix equations.
7. Construct and use elementary matrices to perform row operations.
8. Find LU decompositions.
9. Determine whether a set of vectors is a basis and be able to prove simple facts about linear independence and spans. Find the components of a vector with respect to a given basis.
10. Determine whether a mathematical system is a subspace, a vector space, or an inner product space.
11. Use the Gram-Schmidt process to construct an orthonormal basis.
12. Find the matrix of a linear transformation in a different basis.
13. Find matrices for general linear transformations. Determine the kernels and ranges of general linear transformations.
14. Find determinants by cofactor expansion and use Cramer's rule to solve linear systems of equations.
15. Use the cross product to find areas, volumes, and perpendicular vectors.
16. Find eigenvalues and eigenvectors of matrices and linear transformations and construct diagonal matrices for the transformations.
17. Perform operations with complex numbers including finding the nth roots of complex numbers.

3. Required Materials

Textbook: Ron Larson, *Elementary Linear Algebra*, 8e edition, Cengage, 2017.

4. Chapters and Sections

Chapter 1: Systems of Linear Equations

- 1.1 Introductions to Systems of Linear Equations
- 1.2 Gaussian Elimination and Gauss-Jordan Eliminations

Chapter 2: Matrices

- 2.1 Operations with Matrices
- 2.2 Properties of Matrix Operations
- 2.3 The Inverse of a Matrix
- 2.4 Elementary Matrices

Chapter 3: Determinants

- 3.1 The Determinant of a Matrix
- 3.2 Determinants and Elementary Operations
- 3.3 Properties of Determinants
- 3.4 Applications of Determinants

Chapter 4: Vector Spaces

- 4.1 Vectors in \mathbb{R}^n
- 4.2 Vector Spaces
- 4.3 Subspaces of Vector Spaces
- 4.4 Spanning Sets and Linear Independence
- 4.5 Basis and Dimension
- 4.6 Rank of a Matrix and Systems of Linear Equations
- 4.7 Coordinates and Change of Basis

Chapter 5: Inner Product Spaces

- 5.1 Length and Dot Product in \mathbb{R}^n
- 5.2 Inner Product Spaces
- 5.3 Orthonormal Bases: Gram-Schmidt Process
- 5.4 Mathematical Models
- 5.5 Applications of Inner Product Spaces

Chapter 6: Linear Transformations

- 6.1 Introduction to Linear Transformations
- 6.2 The Kernel and Range of a Linear Transformation
- 6.3 Matrices for Linear Transformations
- 6.4 Transition Matrices and Similarity
- 6.5 Applications of Linear Transformations

Chapter 7: Eigenvalues and Eigenvectors

- 7.1 Eigenvalues and Eigenvectors
- 7.2 Diagonalization
- 7.3 Symmetric Matrices and Orthogonal Diagonalization

Chapter 8: Complex Vector Spaces

- 8.1 Complex Numbers
- 8.2 Conjugates and Division of Complex Numbers
- 8.3 Polar Form and DeMoivre's Theorem

5. Basis of Student Assessment (Weighting)

Your internet connection and technology are your responsibility.

(a) Assignments (10%)

Practice Assignment: (no marks) Due Friday January 22nd

Assignment 1: Due Friday January 29th

Assignment 2: Due Friday February 26th

Assignment 3: Due Friday March 19th

Assignment 4: Due Friday April 16th

(b) Quizzes(60%)

Quiz 1: (During Scheduled Class time) Wednesday January 27th

Quiz 2: (During Scheduled Class time) Monday March 1st

Quiz 3: (During Scheduled Class time) Monday March 15th

Test 4: (During Scheduled Class time) Wednesday March 31st

(c) Final Exam (30%)

Students MUST be available to write the exam at the scheduled time.

Final Exam Period: April 19 – 27

Academic Integrity:

The Department of Mathematics and Statistics has prepared a handout called “Student Guidelines for Academic Integrity” to help you interpret college policies involving student conduct, academic dishonesty, plagiarism, etc. It is your responsibility to become familiar with the contents of the document and the college policies it references. This document can be found in the “Course Documents” module of D2L.

The School of Arts and Science has prepared its own set of Academic Honesty Guidelines, which you should also review. It can be found under the heading “Academic Resources” on the school webpage camosun.ca/learn/school/arts-science/archives/index.html.

The move to online learning and assessment brings with it some new challenges. With regard to academic integrity, the key point to remember is

The work you submit must be your own!

When writing quizzes, you may not seek or obtain help from anyone else. That includes family, friends, classmates, tutors, websites, etc. You may use a basic scientific calculator, such as the Sharp EL-531, or other similar calculator or similarly capable program or app, but you may not use more advanced tools like Maple, Wolfram|Alpha, graphing calculators, etc.

You are expected to be able to write quizzes without reference to any books, notes, or other materials. Nevertheless, you are permitted to refer to your course notes and/or the textbook, but no other resources. Keep in mind that if you find yourself having to look something up in your notes or the textbook, you will likely not finish your quiz on time.

With regard to assignments, your work must again be your own. Collaboration with other students is permitted so long as it does not turn into plagiarism. Needless to say, you may not use “homework cheat” websites such as Chegg, Slader, Course Hero, etc.

Minimum consequences for academic dishonesty in this course are as follows:

Assignments: The student will receive a zero for all of the assignment.

Quizzes: The student will receive a zero for the quiz.

Final Exam: The student will receive a failing grade for the course.

6. Grading System

Standard Grading System (GPA)

Competency Based Grading System

7. Recommended Materials to Assist Students to Succeed Throughout the Course

Camosun Online Math Lab: <http://camosun.ca/services/help-centres/math-help.html#MATH072>

CalcChat: <https://www.calcchat.com/>

8. College Supports, Services and Policies



Immediate, Urgent, or Emergency Support

If you or someone you know requires immediate, urgent, or emergency support (e.g. illness, injury, thoughts of suicide, sexual assault, etc.), **SEEK HELP**. Resource contacts @ <http://camosun.ca/about/mental-health/emergency.html> or <http://camosun.ca/services/sexual-violence/get-support.html#urgent>

College Services

Camosun offers a variety of health and academic support services, including counselling, dental, disability resource centre, help centre, learning skills, sexual violence support & education, library, and writing centre. For more information on each of these services, visit the **STUDENT SERVICES** link on the College website at <http://camosun.ca/>

College Policies

Camosun strives to provide clear, transparent, and easily accessible policies that exemplify the college's commitment to life-changing learning. It is the student's responsibility to become familiar with the content of College policies. Policies are available on the College website at <http://camosun.ca/about/policies/>. Education and academic policies include, but are not limited to, Academic Progress, Admission, Course Withdrawals, Standards for Awarding Credentials, Involuntary Health and Safety Leave of Absence, Prior Learning Assessment, Medical/Compassionate Withdrawal, Sexual Violence and Misconduct, Student Ancillary Fees, Student Appeals, Student Conduct, and Student Penalties and Fines.

A. GRADING SYSTEMS <http://camosun.ca/about/policies/index.html>

The following two grading systems are used at Camosun College:

1. Standard Grading System (GPA)

Percentage	Grade	Description	Grade Point Equivalency
90-100	A+		9
85-89	A		8
80-84	A-		7
77-79	B+		6
73-76	B		5
70-72	B-		4
65-69	C+		3
60-64	C		2
50-59	D		1
0-49	F	Minimum level has not been achieved.	0

2. Competency Based Grading System (Non GPA)

This grading system is based on satisfactory acquisition of defined skills or successful completion of the course learning outcomes

Grade	Description
COM	The student has met the goals, criteria, or competencies established for this course, practicum or field placement.
DST	The student has met and exceeded, above and beyond expectation, the goals, criteria, or competencies established for this course, practicum or field placement.
NC	The student has not met the goals, criteria or competencies established for this course, practicum or field placement.

B. Temporary Grades

Temporary grades are assigned for specific circumstances and will convert to a final grade according to the grading scheme being used in the course. See Grading Policy at <http://camosun.ca/about/policies/index.html> for information on conversion to final grades, and for additional information on student record and transcript notations.

Temporary Grade	Description
I	<i>Incomplete:</i> A temporary grade assigned when the requirements of a course have not yet been completed due to hardship or extenuating circumstances, such as illness or death in the family.
IP	<i>In progress:</i> A temporary grade assigned for courses that are designed to have an anticipated enrollment that extends beyond one term. No more than two IP grades will be assigned for the same course.
CW	<i>Compulsory Withdrawal:</i> A temporary grade assigned by a Dean when an instructor, after documenting the prescriptive strategies applied and consulting with peers, deems that a student is unsafe to self or others and must be removed from the lab, practicum, worksite, or field placement.