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

MATH-125-D01
Introduction to Linear Algebra
Fall 2020

COURSE OUTLINE

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

Ω *Please note: This outline will not be kept indefinitely. It is recommended students keep this outline for their records, especially to assist in transfer credit to post-secondary institutions.*

1. Instructor Information

(a) Instructor	Laura Shepherd			
(b) Office hours	By Email: Monday – Friday 8:30 am – 2:20 pm			
(c) Location	N/A			
(d) Phone	N/A	**Alternative:**		
(e) E-mail	shepherd@camosun.bc.ca			
(f) Website	https://online.camosun.ca/d2l/home			

2. Intended Learning Outcomes

(If any changes are made to this part, then the Approved Course Description must also be changed and sent through the approval process.)

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

(a) 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 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 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)

(a) Assignments (15%)

Practice Assignment (no marks) Due Friday September 11th.
Assignment 1 Due Monday September 21st
Assignment 2 Due Tuesday October 20th
Assignment 3 Due Tuesday November 17th
Assignment 4 Due Friday December 11th

(b) Quizzes(25%)

Quiz 1 (During Scheduled Class time) Monday September 28th Quiz 1 (During Scheduled Class time) Tuesday October 27th
Quiz 1 (During Scheduled Class time) Tuesday November 24th

(c) Term Tests(30%)

Test 1 (During Scheduled Class time) Monday October 5th
Test 2 (During Scheduled Class time) Tuesday November 3rd Test 3 (During Scheduled Class time) Tuesday December 1st

(d) Final Exam (30%)

Final Exam Period: December 14th - 22th

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

6. Grading System

[X] 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	*Incomplete*: 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	*In progress*: 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	*Compulsory Withdrawal*: 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.