



## COURSE OUTLINE

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

Ω Please note: the College electronically stores this outline for five (5) years only.  
It is **strongly recommended** you keep a copy of this outline with your academic records.  
You will need this outline for any future application/s for transfer credit/s to other colleges/universities.

### 1. Instructor Information

(a)	Instructor:	Dan Bergerud		
(b)	Office Hours:	12:30 – 1:30		
(c)	Location:	E264		
(d)	Phone:	370 3495	Alternative Phone:	
(e)	Email:	bergerud@camosun.bc.ca		
(f)	Website:			

### 2. Intended Learning Outcomes

(No changes are to be made to these Intended Learning Outcomes as approved by the Education Council of Camosun College.)

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

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

### 4. Course Content and Schedule

OUTLINE:

1. Systems of Linear Equations
  - 1.1 Introduction to Systems of Linear Equations
  - 1.2 Gaussian Elimination and Gauss-Jordan Elimination
2. Matrices
  - 2.1 Operations with Matrices
  - 2.2 Properties of Matrix Operations
  - 2.3 The Inverse of a Matrix
  - 2.4 Elementary Matrices
3. Determinants
  - 3.1 The Determinant of a Matrix
  - 3.2 Determinants and Elementary Operations
  - 3.3 Properties of Determinants
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
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
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
7. Eigenvalues and Eigenvectors
  - 6.1 Eigenvalues and Eigenvectors
  - 6.2 Diagonalization
  - 6.4 Symmetric Matrices and Orthogonal Diagonalization
8. Complex Numbers – (Online)
  - 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)

EVALUATION: The final grades in the course will be determined from marks on weekly assignments, 2 class quizzes, and a final exam.

Assignments	20%
Quizzes	30%
Final Exam	50%

## 6. Grading System

*(No changes are to be made to this section unless the Approved Course Description has been forwarded through the Education Council of Camosun College for approval.)*

### 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	Minimum level of achievement for which credit is	1

		granted; a course with a "D" grade cannot be used as a prerequisite.	
0-49	F	Minimum level has not been achieved.	0

### 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 E-1.5 at [camosun.ca](http://camosun.ca) 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, due to design may require a further enrollment in the same course. No more than two IP grades will be assigned for the same course. <i>(For these courses a final grade will be assigned to either the 3<sup>rd</sup> course attempt or at the point of course completion.)</i>
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.

### 7. Recommended Materials or Services to Assist Students to Succeed Throughout the Course

#### LEARNING SUPPORT AND SERVICES FOR STUDENTS

There are a variety of services available for students to assist them throughout their learning. This information is available in the College calendar, at Student Services, or the College web site at [camosun.ca](http://camosun.ca).

#### STUDENT CONDUCT POLICY

There is a Student Conduct Policy **which includes plagiarism**. It is the student's responsibility to become familiar with the content of this policy. The policy is available in each School Administration Office, at Student Services, and the College web site in the Policy Section.

#### ADDITIONAL COMMENTS AS APPROPRIATE OR AS REQUIRED