CAMOSUN COLLEGE	**School of Arts & Science** **Department of Mathematics & Statistics** **MATH 251** **Matrix Algebra for Engineers** **Quarter 2, 2016**

COURSE OUTLINE

The course description is online @ http://camosun.ca/learn/calendar/current/web/math.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:	Gilles Cazelais		
(b)	Office Hours:	http://pages.pacificcoast.net/~cazelais/schedule.html		
(c)	Location:	CBA 158		
(d)	Phone:	370 - 4495		
(e)	Email:	Cazelais@camosun.bc.ca		
(f)	Website:	http://pages.pacificcoast.net/~cazelais/251.html		

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 set of vectors in n-dimensional Euclidean space forms a subspace.
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 n'th roots of complex numbers.

3. Required Materials

(a) Textbook: *Linear Algebra, A Modern Introduction* (3rd Edition) by David Poole.

(b) Calculator: Only scientific calculators are allowed for the tests and the final exam. Programmable or graphing calculators are not allowed.

4. Course Content and Schedule

1. Vectors
    - The Geometry and Algebra of Vectors (1.1)
    - Length and Angle: The Dot Product (1.2)
    - Lines and Planes (1.3)
    - Exploration: The Cross Product

2. Systems of Linear Equations
    - Introduction to Systems of Linear Equations (2.1)
    - Direct Methods for Solving Linear Systems (2.2)
    - Spanning Sets and Linear Independence (2.3)
    - Applications (2.4)

3. Matrices
    - Matrix Operations (3.1)
    - Matrix Algebra (3.2)
    - The Inverse of a Matrix (3.3)
    - The LU Factorization (3.4)
    - Subspaces, Basis, Dimensions, and Rank (3.5)
    - Introductions to Linear Transformations (3.6)

4. Complex Numbers (Appendix C)

5. Eigenvalues and Eigenvectors
    - Introduction to Eigenvalues and Eigenvectors (4.1)
    - Determinants (4.2)
    - Exploration: Geometric Applications of Determinants
    - Eigenvalues and Eigenvectors of *n* x *n* matrices (4.3)
    - Similarity and Diagonalization (4.4)
    - Applications (4.6)

6. Orthogonality
    - Orthogonality in $\mathbb{R}^n$ (5.1)
    - Orthogonal Complements and Orthogonal Projections (5.2)
    - The Gram-Schmidt Process and the QR Factorization (5.3)
    - Orthogonal Diagonalization of Symmetric Matrices (5.4)

7. Distance and Approximation
    - Least Squares Approximation (7.3)

5. Basis of Student Assessment (Weighting)

(a) Three Term Tests 50%

Tentative Test Dates: Jan 26, Feb 23, Mar 15

(b) Final Exam 50%

To pass the course, a student must get at least 50% on the final exam.

If your term work is at least 50% and you get 60% or higher in the final exam, then you will receive a C in the course even if your overall average is under 60%.

The final exam will cover the entire course and will be 3 hours long. As stated in the current college calendar on page 34, “students are expected to write tests and final examinations at the scheduled time and place.” Exceptions will only be considered due to **emergency** circumstances as outlined in the calendar. Holidays or scheduled flights are not considered to be emergencies.

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.

6. Grading System

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 granted; a course with a "D" grade cannot be used as a prerequisite.	1
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** 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, 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. *(For these courses a final grade will be assigned to either the 3rd course attempt or at the point of course completion.)*
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.

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.

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.