		School of Arts & Science ***MATHEMATICS DEPARTMENT*** **MATH 261-X01** **Applied Linear Algebra** **2008 Q2**	
		COURSE OUTLINE	

Ω *Please note: this outline will be electronically stored for five (5) years only.*
It is strongly recommended students keep this outline for your records.

1. Instructor Information

(a)	Instructor:	Bogdan Verjinschi	
(b)	Office Hours:	M, Tu, Tr, F 12:30-1:20 & M 3:30-4:20	
(c)	Location:	CBA 151	
(d)	Phone:	370-4490	Alternative Phone:
(e)	Email:	verjinschi@camosun.bc.ca	
(f)	Website:	http://verjinschi.disted.camosun.bc.ca	

2. Intended Learning Outcomes

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

1. Plot a complex number given in rectangular or polar form in the x-y plane and perform calculations involving complex numbers.
2. Find n^{th} roots of a complex number.
3. Use Gauss and/or Gauss Jordan elimination to solve a system of linear equations.
4. Perform basic matrix operations.
5. Find inverses of matrices using Gauss and/or Gauss Jordan elimination.
6. Evaluate the determinant of a matrix using the properties of determinants.
7. Evaluate a determinant using the cofactor expansion.
8. Solve a system of linear equations using Cramer's Rule.
9. Find the inverse of a matrix using its adjoint.
10. Sketch vectors in 2-space and 3-space and perform basic operations with vectors.
11. Use the dot product and cross product to solve different geometric problems in 2-spaces and 3-spaces.
12. Perform basic operations on vectors in R^n.
13. Verify that a mapping is a linear transformations from R^n to R^m.
14. Determine whether a collection of vectors is linearly independent or forms a basis for a vector space.
15. Find the row space, column space, nullspace, rank and nullity of a linear transformation.
16. Find the length of a vector and the angle between two vectors in an inner product space.
17. Determine whether two vectors are orthogonal in an inner product space.
18. Use the Gram-Schmidt process and the QR-Decomposition.
19. Change basis in an inner product space.

20. Apply the least squares method in approximation.
21. Find the eigenvalues and eigenvectors of a square matrix.
22. Diagonalize a square matrix.
23. Find an LU-decomposition of a square matrix.

3. Required Materials

Text: Howard Anton and Chris Rorres, Elementary Linear Algebra, 9th Edition, Wiley, 2005.

4. Course Content and Schedule

Complex Vector Spaces

Text (week)	Hours	Topic
10.1(1)	1	Complex Numbers
10.2(1)	1	Modulus; Complex Conjugate; Division
10.3(1)	2	Polar Form; DeMoivre's Theorem
Total hours	4	

System of Linear Equations and Matrices

Text (week)	Hours	Topic
1.1, 1.2(1)	2	Introduction to Systems of Linear Equations
1.3(2)	1	Matrices and Matrix Operations
1.4(2)	2	Inverses; Rules of Matrix Arithmetic
1.5(2)	1	Elementary Matrices and a Method for Finding A^{-1}
1.6(2)	1	Further Results on Systems of Equations and Invertibility
1.7(2)	1	Diagonal, Triangular, and Symmetric Matrices
Total hours 8		

Determinants

Text (week)	Hours	Topic
2.1(2)	1	The Determinant Function
2.2(2)	1	Evaluating Determinants by Row Reduction
2.3(3)	2	Properties of the Determinant Function
2.4(3)	2	Cofactor Expansion; Cramer's Rule
Total hours 6		

Vectors in 2-Space and 3-Space

Text(week)	Hours	Topic
3.1(3)	1	Introduction to Vectors (Geometric)
3.2(3)	1	Norm of a Vector; Vector Arithmetic
3.3(3)	2	Dot product; Projections
3.4(4)	2	Cross Product
3.5(4)	2	Lines and Planes in 3-Space
Total hours 8		

Test #1   21 January 2008 (tentative date)

Euclidean Vector Spaces

Text (week)	Hours	Topic
4.1(4)	2	Euclidean n-Space

4.2(5)	2	Linear Transformations from R^n to R^m
Total hours 4

General Vector Spaces

Text (week)	Hours	Topic
5.1(5)	1	Real Vector Spaces
5.2(5)	2	Subspaces
5.3(5)	2	Linear Independence
5.4(6)	2	Basis and Dimension
5.5(6)	2	Row Space, Column Space, and Nullspace
5.6(6)	1	Rank and Nullity
Total hours 10

Inner Product Spaces

Text (week)	Hours	Topic
6.1(6)	2	Inner Products
6.2(6)	2	Angle and Orthogonality in Inner Product Spaces
6.3(7)	2	Orthonormal Bases; Gram-Schmidt Process
Total hours 6

Test #2   18 February 2008 (tentative date)

Eigenvalues, Eigenvectors

Text (week)	Hours	Topic
7.1(7)	2	Eigenvalues and Eigenvectors
7.2(8)	2	Diagonalization
Total hours 4

Linear Transformations

Text (week)	Hours	Topic
8.1(8)	2	General Linear Transformations
8.2(8)	2	Kernel and Range
8.4(8)	2	Matrices of General Linear Transformations
Total hours 6

Applications

Text (week)	Hours	Topic
9.1 (9)	2	Application to Differential Equations
9.2(9)	2	Geometry of Linear Operators on R^2
9.3(9)	2	Least Squares Fitting to Data
9.4(9)	2	Approximation Problems; Fourier Series

Test # 3   March 10, 2008 (tentative date)

9.5(10)	1	Quadratic Forms
9.6(10)	2	Diagonalizing Quadratic Forms; Conic Sections
9.7(10)	2	Quadric Surfaces
9.8(11)	2	Comparison of Procedures for Solving Linear Systems
9.9(11)	2	LU-Decompositions
Total hours 18

5. Basis of Student Assessment (Weighting)

(a) **Assignments** *will be given throughout the course. Each assignment will be put on the web on Mondays.* **Assignments will not be turned in, but complete understanding of the problems of the assignments will be essential for**

success on the three term tests. *Solutions to the previous week's assignment will be given on the web on Wednesday.*

(b) **3 Tests** (January 21, February 18, March 10)   40% of final mark

(c) **Final Exam** (comprehensive)   60% of final mark

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 on the College web site in the Policy Section.