



**School of Arts & Science**  
**MATHEMATICS DEPARTMENT**  
**MATH 251-Sections X01 and X02**  
**Matrix Algebra for Engineers**  
**2015 Q4**

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## COURSE OUTLINE

### 1. Instructor Information

Instructors:	Raymond Lai (section X01)	Leah Howard (section X02)
Office Hours:	Monday, Wednesday to Friday: 11:30 am – 12:20 pm	Mon & Fri 11:30-1:15 Tues & Thurs 12:30-1:15
Office	CBA 152	CBA 151
Phone:	250-370-4491	250-370-4490
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Website:	<a href="http://faculty.camosun.ca/raymondlai/home-2/courses/">http://faculty.camosun.ca/raymondlai/home-2/courses/</a>	<a href="http://www.leahhoward.com">www.leahhoward.com</a>

### 2. Course Description

This course is for Engineering Bridge students. The topics include: complex numbers, linear systems and matrices, matrix operations, determinants, vectors in 2-space and 3-space, vector spaces, linear dependence and independence, orthogonality, eigenvalues and eigenvectors and linear transformations.

Offered: Quarter 2 and Quarter 4

Credit: 3

In-Class Workload and Format: 6 hours of lecture/week for 11 weeks

Out-of-Class Workload: 6-12 hours/week

Prerequisites: Restricted to students enrolled in the Engineering Bridge Program

### 3. 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.

#### 4. Required Materials

Text: David Poole, *Linear Algebra: A Modern Introduction*, 4th Edition, Brooks/Cole.

Calculator: Any scientific (non-graphing, non-programmable) calculator.

#### 5. Course Content and Tentative Schedule

9 hours	Sections 1.1-1.3	Vectors & Cross Product
6 hours	Sections 2.1-2.3	Systems of Linear Equations
15 hours	Sections 3.1-3.6	Matrices
8 hours	Sections 4.1-4.4	Eigenvalues, Eigenvectors
8 hours	Sections 5.1-5.4	Orthogonality
3 hours	Section 7.3	Least Squares Approximation
5 hours	Appendix C	Complex Numbers

#### 6. Basis of Student Assessment (Weighting)

To get a C or higher in the course, you must pass the final exam (50% or higher) and have an overall average of 60% or higher, computed from:

- 4 Assignments (10%)  
**Due on: Mon. July 13, Mon. July 27, Mon. Aug. 10, Mon. Aug. 24**
- 4 Tests (40%): Test 1 is calculator-free.

Dates	Thurs. July 16	Thurs. July 30	Thurs. Aug 13	Thurs. Aug 27
Coverage (tentative)	1.1-1.3, Cross Product & 2.1	2.2-2.3 & 3.1-3.3	3.4-3.6 & 4.1	4.2-4.4 & 5.1-5.2

- Comprehensive Final Exam (50%): **during the week of Sept. 12 – Sept. 19**

which is then converted to a letter grade using the standard Camosun grade scale (see Grading System (8) below). [Continue on next page.]

*There is one exception:* if your term work is at least 50% \*and\* you received 60% or higher in the final exam, then you will receive a C in the course \*even if\* your overall average is under 60%.

## 7. Course Policy

- Students are responsible for announcements made in class (check with your fellow students if you have to miss a class).
- Students are required to set their mobile phones on vibrate while attending class and writing term tests and final examination.

## 8. 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		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 at **camosun.ca** or 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.

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.

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

Extra help is available from the assistant at the Math Lab: TEC142.

#### 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 on the College web site in the Policy Section.