UNIVERSITY OF THE FRASER VALLEY

ORIGINAL COURSE IMPLEMENTATION DATE: September 1994
REVISED COURSE IMPLEMENTATION DATE: January 2018
COURSE TO BE REVIEWED: (six years after UEC approval) June 2023
Course outline form version: 09/15/14

OFFICIAL UNDERGRADUATE COURSE OUTLINE FORM

Note: The University reserves the right to amend course outlines as needed without notice.

Course Code and Number: MATH 152	**Number of Credits:** 4 Course credit policy (105)
Course Full Title: Linear Algebra for Engineering **Course Short Title (if title exceeds 30 characters):**	
Faculty: Faculty of Science	**Department (or program if no department):** Mathematics & Statistics

Calendar Description:

Intended for engineering students, this course covers basic problems and concepts in Euclidean space, such as matrix algebra, solutions to linear systems of equations, determinants, and eigenvalue problems. Emphasis throughout the course is placed on applications in science and engineering.

Note: This course is offered as MATH 152 and ENGR 152. Students may take only one of these for credit.

Prerequisites (or NONE):	None.
Corequisites (if applicable, or NONE):	
Pre/corequisites (if applicable, or NONE):	MATH 112.

Equivalent Courses (cannot be taken for additional credit)
Former course code/number:
Cross-listed with: **ENGR 152**
Equivalent course(s):
Note: Equivalent course(s) should be included in the calendar description by way of a note that students with credit for the equivalent course(s) cannot take this course for further credit.

Transfer Credit
Transfer credit already exists: ☒ Yes ☐ No
Transfer credit requested (OReg to submit to BCCAT):
☐ Yes ☐ No (if yes, fill in transfer credit form)
Resubmit revised outline for articulation: ☒ Yes ☐ No
To find out how this course transfers, see **bctransferguide.ca**.

Total Hours: 60
Typical structure of instructional hours:

Lecture hours	60
Seminars/tutorials/workshops	
Laboratory hours	
Field experience hours	
Experiential (practicum, internship, etc.)	
Online learning activities	
Other contact hours:	
Total	**60**

Special Topics
Will the course be offered with different topics?
☐ Yes ☒ No
If yes, different lettered courses may be taken for credit:
☐ No ☐ Yes, repeat(s) ☐ Yes, no limit
Note: The specific topic will be recorded when offered.

Maximum enrolment (for information only): 36

Expected frequency of course offerings (every semester, annually, every other year, etc.): **Every winter semester**

Department / Program Head or Director: Ian Affleck	**Date approved:**	March 2017
Faculty Council approval	**Date approved:**	April 28, 2017
Campus-Wide Consultation (CWC)	**Date of posting:**	n/a
Dean/Associate VP: Lucy Lee	**Date approved:**	April 28, 2017
Undergraduate Education Committee (UEC) approval	**Date of meeting:**	June 16, 2017

Learning Outcomes

Upon successful completion of this course, students will be able to:

1. Solve linear systems of equations;
2. Determine whether a set of vectors is linearly independent;
3. Construct a basis for a vector space and determine its dimension;
4. Determine whether a transformation is linear, and represent linear transformations as matrix multiplication;
5. Perform operations of matrix algebra;
6. Calculate determinants;
7. Determine the eigenvalues and eigenvectors of matrices, and use them to diagonalize matrices when appropriate;
8. Perform elementary algebraic operations with complex numbers;
9. Construct solutions to linear systems of ordinary differential equations;
10. Calculate the projection of a vector onto a vector subspace using inner products;
11. Compute Fourier approximations;
12. Use appropriate technology to perform the calculations associated with the previous objectives.

Prior Learning Assessment and Recognition (PLAR)

☒ Yes ☐ No, PLAR cannot be awarded for this course because

Typical Instructional Methods (guest lecturers, presentations, online instruction, field trips, etc.; may vary at department's discretion)

Lectures, with tutorial sessions.

Grading system: Letter Grades: ☒ Credit/No Credit: ☐ Labs to be scheduled independent of lecture hours: Yes ☐ No ☐

NOTE: The following sections may vary by instructor. Please see course syllabus available from the instructor.

Typical Text(s) and Resource Materials (if more space is required, download Supplemental Texts and Resource Materials form)

	Author (surname, initials)	Title (article, book, journal, etc.)	Current ed.	Publisher	Year
1.	Lay D., Lay, S., & McDonald, J.	Linear Algebra and its Applications	☒	Pearson	
2.	Strang, G	Linear Algebra and its Applications	☒	Thompson	
3.	Herman, E., & Pepe, M.	Visual Linear Algebra	☒	Wiley	
4.			☐		
5.			☐		

Required Additional Supplies and Materials (software, hardware, tools, specialized clothing, etc.)

Typical Evaluation Methods and Weighting

Final exam:	40%	Assignments:	15%	Midterm exam:	30%	Practicum:	%
Quizzes/tests:	**15**%	Lab work:	%	Field experience:	%	Shop work:	%
Other:	%	Other:	%	Other:	%	Total:	100%

Details (if necessary): Students must achieve at least 40% on the final exam in order to receive credit for this course.

Typical Course Content and Topics

Use of graphing calculator and/or CAS expected. Most examples and demonstrations will be in terms of 2- and 3-dimensions.

1. Linear systems of equations; row-reduced echelon form, rank.
2. Vector space, dot product, vector product (in 3D); applications to 2D and 3D geometry.
3. Matrix algebra, elementary matrices, inverses, transposes.
4. Matrix form of geometrically defined linear transformations.
5. Properties of determinants.
6. Linear dependence and independence, span, dimension.
7. Orthogonal transformations, orthonormal basis.
8. Algebra of complex numbers, De Moivre's theorem.
9. Eigenvalues / -vectors, diagonalization, symmetric matrices.
10. Linear systems of differential equations, diagonizable case, 2x2 nondiagonalizable case.
11. Fourier series approximations.