The University of Western Ontario
Faculty of Science

DEPARTMENT OF APPLIED MATHEMATICS

AM 1411B – LINEAR ALGEBRA FOR ENGINEERING
COURSE OUTLINE 2015-2016 Winter Term

Description

This course first introduces the methods for analyzing and solving systems of linear equations. Engineering examples are used to motivate the subject. Vectors and matrices are then introduced. Finally, the analysis of linear systems by eigenvalues and eigenvectors is covered. All topics include engineering examples. In addition, Matlab is introduced during tutorials in laboratories.

Prerequisites
High school mathematics

Corequisites
None

Antirequisites
None.

Contact Hours
3 lecture hours , 2 tutorial hours, 0.5 FTE course.

Lecture section 001: MWF 8:30 – 9:30, AHB–1R40.

Tutorial section 002: Monday 2:30 – 4:30,

Tutorials: SEB-2100 - Jan. 11 (all), 18 (groups C, D) , 25 (groups A, B), Feb. 8 (groups C, D), 22 (groups A, B), Mar. 7 (groups C, D), 14 (groups A, B), 21 (groups C, D), 28 (groups A, B), April 4 (all).

Computer labs: Jan. 18 (group A in HSB 14, group B in HSB 16),
              Jan 25 (group C in HSB 14, group D in HSB 16),
              Feb. 8 (group A in HSB 14, group B in HSB 16),
              Feb. 22 (group C in HSB 14, group D in HSB 16),
              Mar. 7 (group A in HSB 14, group B in HSB 16),
              Mar.14 (group C in HSB 14, group D in HSB 16).

      Test 1:   Feb. 1   (groups A, B in SEB-2100, group C in HSB 14, group D in HSB 16)
      Test 2:   Feb. 29 (groups A, B in SEB-2100, group C in HSB 14, group D in HSB 16)
MATLAB test: Mar. 21 (group A in HSB 14, group B in HSB 16),
                Mar. 28 (group C in HSB 14, group D in HSB 16).

Tutorial section 003: Tuesday 10:30 – 12:30:

Tutorials:
Jan. 12 (groups A,B,C in SEB 2099, group D in HSB 14), 19 (groups C, D in SEB 2099), 26 (groups A, B in SEB 2099), Feb. 9 (groups C, D in SEB 2099), 23 (groups A, B in SEB 2099), Mar. 8 (groups C, D in SEB 2099), 15 (groups A, B in SEB 2099) , 22 (groups C, D in SEB 2099) , 29 (groups A, B in SEB 2099) , April 5 (groups A,B,C in SEB 2099, group D in HSB 14).

Computer labs: Jan. 19 (group A in HSB 14, group B in HSB 16),
              Jan 26 (group C in HSB 14, group D in HSB 16),
              Feb. 9 (group A in HSB 14, group B in HSB 16),
              Feb. 23 (group C in HSB 14, group D in HSB 16),
              Mar. 8 (group A in HSB 14, group B in HSB 16),
              Mar.15 (group C in HSB 14, group D in HSB 16).

         Test 1:   Feb. 2   (groups A, B in SEB-2099, group C in HSB 14, group D in HSB 16)
         Test 2:   Mar. 1 (groups A, B in SEB-2099, group C in HSB 14, group D in HSB 16)
MATLAB test: Mar. 22 (group A in HSB 14, group B in HSB 16),
             Mar. 29 (group C in HSB 14, group D in HSB 16).

Tutorial Section 004: Friday 2:30 – 4:30:

Tutorials: 3M 3250 - Jan. 15 (all) , 22 (groups C, D), 29 (groups A, B), Feb. 12 (groups C, D), 26 (groups A,B), Mar. 11 (groups C,D), 18 (groups A, B), 25 (groups C, D), April 1 (groups A,B).

Computer labs: Jan. 22 (group A in SH 1310, group B in HSB 13),
              Jan 29 (group C in SH 1310, group D in HSB 13),
              Feb. 12 (group A in SH 1310, group B in HSB 13),
              Feb. 26 (group C in SH 1310, group D in HSB 13),
              Mar. 11 (group A in SH 1310, group B in HSB 13),
              Mar.18 (group C in SH 1310, group D in HSB 13).

         Test 1:   Feb. 5   (groups A, B in 3M 3250, group C in SH 1310, group D in HSB 13)
         Test 2:   Mar. 4 (groups A, B in 3M 3250, group C in SH 1310, group D in HSB 13)
MATLAB test: Mar. 25 (group A in SH 1310, group B in HSB 13),
             April 1 (group C in SH 1310, group D in HSB 13).

Instructor
Prof. B. Tudose (MC 286) email: btudose@uwo.ca

Required Text

"Elementary Linear Algebra" 11th edition by Howard Anton, Wiley (2014).

Reference Texts
All books called linear algebra contain similar material. Go to the library and browse the shelves around books catalogued at QA 184.

General Learning Objectives

Knowledge Base	X	Individual Work	x	Ethics and Equity	
Problem Analysis	X	Team Work		Economics and Project Management	
Investigation		Communication		Life-Long Learning	X
Design		Professionalism			
Engineering Tools	X	Impact on Society			

General Learning Objectives

The general objectives for student are:
- Understand where linear equations arise in engineering.
- Understand the concepts of consistent and inconsistent equations.
- Understand the concept of a linear transformation.
- Understand the concept of an eigenvector.

Specific Learning Objectives

- Engineering Applications**:** electrical networks, pipe and traffic flow, data fitting.

- Systems of Linear Equations**:** solving systems of linear equations by Gaussian elimination

- Matrices**:** matrix operations, inverses, elementary matrices, special types of matrices

- Determinants**:** cofactor expansion, properties, Cramer's rule

- Linear transformations**:** linear mapping between vector spaces, matrix representation of linear transformations

- Orthogonality: inner product, orthonormal bases, Gram-Schmidt process, least-squares approximations, orthonormal matrices

- Eigenvectors: finding eigenvalues and eigenvectors, characteristic polynomial, properties of eigenvalues and eigenvectors, diagonalization, geometric and algebraic multiplicity, similarity, orthogonal diagonalization of real symmetric matrices

Evaluation
The final course mark will be determined as follows:
Tutorial tests: 30 %
Matlab test: 10 %

Final Examination   60 %

Tests and Examinations
The tutorial tests will be one hour long, **closed book**. The final examination will be **closed book** and will take place in the regular examination period. Calculators will not be allowed in any test or examination. The use of communication devices is strictly prohibited.

Missing Quizzes and Exams:
Missing an exam or quiz will result in a grade of zero for that exam or quiz, unless permission is granted from Engineering Student Services. If permission is granted, a prorated mark will be assigned. There will be **no makeups for quizzes or midterms.**

Registration in Tutorials and Lecture Sections

Students **will not receive credit** for writing quizzes in tutorial sections in which they are not registered. Each tutorial session is linked to a particular lecture section (as indicated above) and quizzes will be set according to the instructor of that section. You are expected to know which lecture section and tutorial section you are registered in and your attendance at each is required.

Addendum to all Applied Mathematics Course Outlines

If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to your faculty's Dean's Office as soon as possible and contact your instructor immediately. It is the student's responsibility to make alternative arrangements with their instructor once the accommodation has been approved and the instructor has been informed. In the event of a missed final exam, a "Recommendation of Special Examination" form must be obtained from your faculty's Dean's Office immediately. For further information please see: http://studentservices.uwo.ca/secure/index.cfm

A student requiring academic accommodation due to illness, should use the Student Medical Certificate when visiting an off-campus medical facility or request a Records Release Form (located in the Dean's Office) for visits to Student Health Services. The form can be found here:
https://studentservices.uwo.ca/secure/medical_document.pdf

Mental Health Statement:

Students who are in emotional/mental distress should refer to Mental Health@Western http://www.uwo.ca/uwocom/mentalhealth/ for a complete list of options about how to obtain help.

Accessibility:

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 ext. 82147 if you have questions regarding accommodation.

Support Services:

Learning-skills counselors at the Student Development Centre (http://www.sdc.uwo.ca) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counseling.

Additional student-run support services are offered by the USC, http://westernusc.ca/services.

The website for Registrarial Services is http://www.registrar.uwo.ca.

The UWO Senate Academic Handbook has specified that the following points should be added to all course outlines:

1. Plagiarism: Students must write their essays and assignments in their own words. Whenever students take an idea, or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. Plagiarism is a major academic offence (see Scholastic Offence Policy in the Western Academic Calendar).

2. Plagiarism Checking: The University of Western Ontario uses software for plagiarism checking. Students may be required to submit their written work and programs in electronic form for plagiarism checking.

3. Prerequisites for a course: Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you will be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

4. If computer-marked multiple-choice tests and/or exams are given: Use may be made of software to check for unusual coincidences in answer patterns that may indicate cheating.

Accreditation (AU) Breakdown
Engineering Science   =   100%