NMM 1411A
Linear Algebra with Numerical Analysis for Engineering

Course outline for Fall 2021

1. Technical Requirements:

 Stable internet connection

 Laptop or computer with MATLAB installed

 Working microphone

 Working webcam

2. Course Overview and Important Dates: LEC 001 M/W/F 8:30am-9:20am, SSC-2050

Delivery Mode: in-person	Dates	Time
TUT: 002, SEB-1056	Thursday	**10:30-11:30 AM**
CompLab: 002, HSB-13	Thursday	**11:30 AM-12:30 PM**
TUT: 003, HSB-11	Thursday	**10:30-11:30 AM**
CompLab: 003, HSB-16	Thursday	**11:30 AM-12:30 PM**
TUT: 004, HSB-11	Wednesday	**7:00 PM-8:00 PM**
CompLab: 004, HSB-16	Wednesday	**8:00 PM-9:00 PM**
TUT: 005, HSB-9	Wednesday	**7:00 PM-8:00 PM**
CompLab: 005, SSC-1032	Wednesday	**8:00 PM-9:00 PM**

Classes Start	Reading Week	Classes End	Study day(s)	Exam Period
September 8	November 1 - 7	December 8	December 9	December 10 - 21

* November 12, 2021: Last day to drop a first-term half course or a first-term full course without penalty

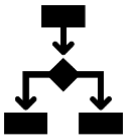
3. Contact Information

Course Coordinator	Contact Information
LEC 001: Prof. Alex Buchel	abuchel@uwo.ca

Instructor(s) or Teaching Assistant(s)	Contact Information
TUT 002:	
TUT 003:	
TUT 004:	
TUT 005:	

4. Course Description and Design

Matrix operations, systems of linear equations, linear spaces and transformations, determinants, eigenvalues and eigenvectors, applications of interest to Engineers including diagonalization of matrices, quadratic forms, orthogonal transformations; introduction to MATLAB with applications from linear algebra.
Antirequisite(s): Mathematics 1600A/B.
Prerequisites: Ontario Secondary School MHF4U or MCV4U, or Mathematics 0110A/B
Restricted to students in the Faculty of Engineering.



Mode	Section	Frequency
in-person	LEC 001	3 lectures/weekly
In-person	TUT/Lab 002-005	1-hour weekly for each subsection

☒ Attendance at lecture/TUT/Lab sessions is strongly recommended
☒ **Tests administered during TUT/Lab sections, attendance is mandatory**

All course material will be posted to OWL: http://owl.uwo.ca. Any changes will be indicated on the OWL site and discussed with the class.

If students need assistance, they can seek support on the OWL Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

Google Chrome or Mozilla Firefox are the preferred browsers to optimally use OWL; update your browsers frequently. Students interested in evaluating their internet speed, please click here.

5. Learning Outcomes

General learning objectives:

- 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.
- Introduction to Matlab software as a tool for computerized solution of linear algebra problems.

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

6. Course Content and Schedule

Week	Dates	Lectures #	"Elementary Linear Algebra" #
1	Sept 8 – 12	Introduction/logistics/1	1.9
2	Sept 13 – 19	1,2,3	1.9, 1.1, 1.2
3	Sept 20 – 26	4, 5, 6	1.2, 1.3
4	Sept 27 – Oct 3	7, 8, 9	1.4, 1.5, 1.6
5	Oct 4 – 10	10, 11, 12	1.6, 1.7, 2.1
6	Oct 11 – 17	13, 14, 15	2.2, 2.3, 1.8, short review
7	Oct 18 – 24	16,17,18	3.1, 3.2, 4.1
8	Oct 25 – 31	19,20,21	4.1, 4.2, 4.3
9	Nov 1 – 7	Reading Week	N/A
10	Nov 8 – 14	22,23,24	4.3, 4.4, 4.5
11	Nov 15 – 21	25,26,27	4.5, 4.7, 4.8
12	Nov 22 – 28	28,29,30	4.9, 5.1, 5.2
13	Nov 29 – Dec 5	31,32,33	6.1, 6.2, 6.3
14	Dec 6 – 8	34	6.3, review

7. Contingency plan for an in-person class pivoting to 100% online learning

In the event of a COVID-19 resurgence during the course that necessitates the course delivery moving away from face-to-face interaction, all remaining course content will be delivered entirely online, either synchronously (i.e., at the times indicated in the timetable) or asynchronously (e.g., posted on OWL for students to view at their convenience). The grading scheme will not change. Any remaining assessments will also be conducted online as determined by the course instructor.

8. Evaluation

Below is the tentative evaluation breakdown for the course. Any deviations will be communicated.

Assessment	Format	Weighting	Due Date
Test 1	in-person	15%	Week4,duringTUT/Lab
Test 2	in-person	15%	Week7,duringTUT/Lab
Computer lab test	in-person	10%	Week11,duringTUT/Lab
Quizz-1	online	2%	Sep. 30
Quizz-2	online	2%	Oct. 14
Quizz-3	online	2%	Oct. 28
Quizz-4	online	2%	Nov. 18
Quizz-5	online	2%	Dec. 2
Final exam	in-person	50%	TBA

☒ All tests will be during regular TUT/Lab sessions

☒ See "Tutorial_ComputerLab_schedule.pdf" document on OWL (resources folder) for details regarding the tests

☒ See "Online_OWL_Quizzes.pdf" document on OWL (resources folder) for details regarding the OWL quizzes

☒ Details on the Final exam will be provided later

Click here for a detailed and comprehensive set of policies and regulations concerning examinations and grading. The table below outlines the University-wide grade descriptors.

A+	90-100	One could scarcely expect better from a student at this level
A	80-89	Superior work which is clearly above average
B	70-79	Good work, meeting all requirements, and eminently satisfactory
C	60-69	Competent work, meeting requirements
D	50-59	Fair work, minimally acceptable
F	below 50	Fail

Information about tests and examinations:

☒ The online OWL quizzes will be 1h long, open book

☒ The tutorial/lab tests will be 1h long, closed book

☒ Final examination will be 3h long, closed book

☒ Calculators will not be allowed during tests or examination

☒ The use of communication devices is strictly prohibited

☒ Missing an exam or test/quizz will result in a grade of zero for that exam or test/quiz, unless permission is granted from Engineering Student

Services.

☒ If permission is granted, the instructor will provide accommodations

☒ **There will be no makeups for any tests without permission**

9. Communication:

☒ Students should check the OWL site every 24 – 48 hours

☒ Emails will be monitored daily; students will receive a response in 24 – 48 hours

☒ **Emails outside @uwo domain will be ignored**

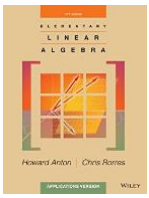
10. Office Hours:

☒ Office hours will be held in person (in PAB 259) and via Zoom on Mondays 9:30-11:30am, starting Sep.20

11. Resources

☒All resources will be posted in OWL

☒ Required textbook: ``Elementary Linear Algebra'' 11th or 12th edition by Howard Anton, Wiley (2014)



☒ Additional resources: All books called linear algebra contain similar material.
Go to the library and browse the shelves around books catalogued at QA 184.

12. Professionalism & Privacy:

Western students are expected to follow the Student Code of Conduct. Additionally, the following expectations and professional conduct apply to this course:

☒ All course materials created by the instructor(s) are copyrighted and cannot be sold/shared

☒ Students will be expected to take an academic integrity pledge before some assessments

13. How to Be Successful in this Class:

Students enrolled in this class should understand the level of autonomy and self-discipline required to be successful.

1. Invest in a planner or application to keep track of your courses. Populate all your deadlines at the start of the term and schedule time at the start of each week to get organized and manage your time.
2. Make it a daily habit to log onto OWL to ensure you have seen everything posted to help you succeed in this class.
3. Follow weekly checklists created on OWL or create your own to help you stay on track.
4. Take notes as you go through the lesson material. Treat this course as you would a face-to-face course. Keeping handwritten notes or even notes on a regular Word document will help you learn more effectively than just reading or watching the videos.
5. Connect with others. Try forming an online study group and try meeting on a weekly basis for study and peer support. Use of OWL Forums is encouraged.
6. **Do not be afraid to ask questions. If you are struggling with a topic, contact your instructor(s) and or teaching assistant(s).**
7. **Attend lectures/TUT/Lab sessions**

14. Western Academic Policies and Statements

Absence from Course Commitments

Policy on Academic Consideration for Student Absences

Students will have up to two (2) opportunities during the regular academic year to use an on-line portal to self-report an absence during the term, provided the following conditions are met: the absence is no more than 48 hours in duration, and the assessment for which consideration is being sought is worth 30% or less of the student's final grade. Students are expected to contact their instructors within 24 hours of the end of the period of the self-reported absence, unless noted on the syllabus. Students are not able to use the self-reporting option in the following circumstances:

- for exams scheduled by the Office of the Registrar (e.g., December and April exams)
- absence of a duration greater than 48 hours,
- assessments worth more than 30% of the student's final grade,
- if a student has already used the self-reporting portal twice during the academic year

If the conditions for a Self-Reported Absence are *not* met, students will need to provide a Student Medical Certificate if the absence is medical or provide appropriate documentation if there are compassionate grounds for the absence in question. Students are encouraged to contact their Faculty academic counselling office to obtain more information about the relevant documentation.

Students should also note that individual instructors are not permitted to receive documentation directly from a student, whether in support of an application for consideration on medical grounds, or for other reasons. **All documentation required for absences that are not covered by the Self-Reported Absence Policy must be submitted to the Academic Counselling office of a student's Home Faculty.**

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Accommodation for Religious Holidays

The policy on Accommodation for Religious Holidays can be viewed here.

Special Examinations

A Special Examination is any examination other than the regular examination, and it may be offered only with the permission of the Dean of the Faculty in which the student is registered, in consultation with the instructor and Department Chair. Permission to write a Special Examination may be given on the basis of compassionate or medical grounds with appropriate supporting documents. To provide an opportunity for students to recover from the circumstances resulting in a Special Examination, the University has implemented Special Examinations dates. These dates as well as other important information about examinations and academic standing can be found here.

Academic Offenses

"Scholastic offences are taken seriously, and students are directed here to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence.

Accessibility Statement

Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Accessible Education (AE) at 661-2111 x 82147 for any specific question regarding an accommodation or review The policy on Accommodation for Students with Disabilities.

Correspondence Statement

The centrally administered **e-mail account** provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at his/her official university address is attended to in a timely manner. You can read about the privacy and security of the UWO email accounts here.

15. BMSUE Academic Policies and Statements

Copyright and Audio/Video Recording Statement

Course material produced by faculty is copyrighted and to reproduce this material for any purposes other than your own educational use contravenes Canadian Copyright Laws. You must always ask permission to record another individual and you should never share or distribute recordings.

Class Medium Mark Statement

The Department of Physics and Astronomy may, in exceptional cases, adjust the final course marks in order to conform to Departmental policy:

"Classes with enrolments greater than 25 are required to have a median grade in the range of 65 to 75%"

Rounding of Marks Statement

Across Undergraduate Education programs, we strive to maintain high standards that reflect the effort that both students and faculty put into the teaching and learning experience during this course. All students will be treated equally and evaluated based only on their actual achievement. ***Final grades*** on this course, irrespective of the number of decimal places used in marking individual assignments and tests, will be calculated to one decimal place and rounded to the nearest integer, e.g., 74.4 becomes 74, and 74.5 becomes 75. Marks WILL NOT be bumped to the next grade or GPA, e.g. a 79

will NOT be bumped up to an 80, an 84 WILL NOT be bumped up to an 85, etc. The mark attained is the mark you achieved, and the mark assigned; requests for mark "bumping" will be denied.

Remote Proctoring Software will be used in this course in the event of health lock-down

Tests and examinations in this course are planned in-person. In the event of health lockdown, all the remaining tests and examinations will be conducted using a remote proctoring service. By taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide personal information (including some biometric data) and the session will be recorded. Completion of this course will require you to have a reliable internet connection and a device that meets the technical requirements for this service. More information about this remote proctoring service, including technical requirements, is available on Western's Remote Proctoring website at: https://remoteproctoring.uwo.ca.

Participants in this course are not permitted to record the sessions, except where recording is an approved accommodation, or the participant has the prior written permission of the instructor.

16. Support Services

The following links provide information about support services at Western University.

Academic Counselling (Science and Basic Medical Sciences)

Appeal Procedures

Registrarial Services

Student Development Services

Student Health Services

17. Addendum to all Numerical Mathematical Methods Course Outlines

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.

For multiple-choice tests and/or exams: Use may be made of software to check for unusual coincidences in answer patterns that may indicate cheating.

18. **Breakdown:** Engineering Science = 100%