

Math 1600A Fall 2024 Course Outline

1. Course Information

Course Information

- *Course Name:* Mathematics 1600A (LINEAR ALGEBRA I)
- *Academic Term:* Fall 2024 (FW24)

List of Prerequisites

One or more of Ontario Secondary School MCV4U, Math 1120A/B, Math 1229A/B, Calculus 1000A/B, Calc 1500A/B. Calc 1000A/B or Calc 1500A/B may be taken as a pre- or corequisite.

List of Antirequisites

Mathematics 1700A/B, Numerical and Mathematical Methods 1411A/B, the former Applied Mathematics 1411A/B, Math 1229A/B, Applied Math 2811B.

Unless you have either the requisites for this course or written special permission from your Dean's Designate (Department/Program Counsellors and Science Academic Advisors) to enroll in it, you may 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.

2. Instructor Information

Course Contact Policies

- Students must use their Western (@uwo.ca) email address when contacting their professor.
- Any email sent to a professor MUST say Math 1600 in the subject line, be addressed to the professor of the section in which the student is enrolled and be sent from a Western email address. If any one of those conditions are violated, the email may be deleted unread.
- In general, email is not an efficient means of contact, and should be limited to urgent matters. For questions about the course material, use the forums or ask questions before/after class or in office hours. For administrative questions, please check first whether the question has been answered on the course outline or OWL site.
- Office Hour information and Help Centre information will be posted on the course OWL site.

3. Course Syllabus, Schedule, Delivery Mode

Course Syllabus

Complex numbers; vectors, lines and planes; solving linear systems; spanning sets and linear independence; matrix algebra; the fundamental subspaces of a matrix; bases, dimension and rank; introduction to linear transformations; determinants; eigenvalues and eigenvectors; similarity and diagonalization; Markov chains and other applications.

Course Learning Outcomes

By the end of this course, students will be able to:

- Calculate the operations in modular arithmetic as well as complex numbers.
- Describe m-dimensional Euclidean space and carry out the vector operations for vectors in \mathbb{R}^m , \mathbb{Z}_n^m , and \mathbb{C}^m .
- Write algebraic representations (as equations in different form) for different geometric objects such as lines, planes and hyperplanes in \mathbb{R}^m .
- Recognize linear equations, systems of linear equations (SLE) and solutions of SLEs.
- Solve SLEs using different methods: elimination method(s), methods of inverse matrix, and Cramer's rule.
- Perform basic matrix operations: addition/subtraction, multiplication and power, inverse and transpose of matrices.
- Determine whether a subset of vectors of a vector space is linearly independent, spanning and/or a basis of the vector space.
- Determine whether or not a subset of a vector space is a subspace of a vector space.
- Find a basis of a subspace of a vector space and its dimension.
- Understand the row space, column space, and null space of a matrix; find bases and dimensions for these subspaces in terms of the rank of the matrix.
- Determine whether or not a map from real n-space to real m-space is a linear transformation.
- Perform basic operations on linear transformations if they are defined: addition, subtraction, scalar multiplication, composition and inverses.
- Find the matrix of a linear transformation on the plane or in 3-space with respect to the standard bases for linear transformations defined geometrically: rotations, reflections, projections.
- State the fundamental theorem of invertible matrices and relate invertibility to various notions in the course.
- Compute the determinant of square matrices using different methods: expansion along rows/columns and using the properties of the determinant.
- Calculate the characteristic polynomial and then the eigenvalues and the corresponding eigenspaces of a given matrix.
- Carry out the computational steps to check whether a matrix is diagonalizable and if it is, diagonalize it

- Judge whether a given statement (in the context of the course material) is true or false. Justify your answers.

Course Delivery:

This is an in-person course, with 3 in-person lecture hours per week

Contingency Plan

Although the intent is for this course to be delivered in person, should any university-declared emergency require some or all of the course to be delivered online, either synchronously or asynchronously, the course will adapt accordingly. The grading scheme will **not** change. Any assessments affected will be conducted online as determined by the course instructor.

Key Sessional Dates:

<i>Classes begin:</i>	September 5, 2024
<i>Last day to drop a course without showing WDN:</i>	September 13, 2024
<i>National Day for Truth and Reconciliation (no classes):</i>	September 30, 2024
<i>Fall Reading Week:</i>	October 12 – 20, 2024
<i>Last day to drop a course without academic penalty:</i>	December 2, 2024
<i>Classes end:</i>	December 6, 2024
<i>Study Days:</i>	December 7-8, 2024
<i>Exam period:</i>	December 9 – 22, 2024

4. Course Materials

Textbook

Custom eBook: MATH 1600: University of Western Ontario: ISBN 9780176907532.

The custom ebook is available to purchase through the Western bookstore.

The textbook/ebook consists of selected sections of the book: D. Poole, *Linear Algebra: A Modern Introduction*, 4th edition.

Learning Management System (OWL)

All course material will be posted to OWL: <https://westernu.brightspace.com/>

Students are responsible for checking the course OWL site (<https://westernu.brightspace.com/>) regularly for news and updates. This is the primary method by which information will be disseminated to all students in the class.

All students are expected to be aware of information, and make use of materials, posted on the course website. Important information will be posted on the Announcement tab of the website.

Note: We will use the announcements tool of OWL Brightspace to send out course announcements. Students are responsible to keep the announcement notification on in their account to make sure to receive all course announcements.

If students need assistance with the course OWL site, they can seek support on the [OWL Brightspace Help](#) page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

Other online platforms/apps used in the course:

Other than the OWL Brightspace website, discussed above, we will use the following websites and apps:

WeBWorK: For online assignments

Gradescope: To upload written assignment and to access the graded midterm

Technical Requirements

In addition to pencil, paper and eraser, you need to have access to:

- Computer or laptop able to run a recent version of web browser such as Chrome, Safari or Firefox.
- Stable high-speed internet connection.
- Document scanner device or app.

Further Course Policies

- All in-person or online interactions with peers, as well as communication with TAs or Professors for this course should be conducted in a professional and respectful manner. Failure to do so will result in academic discipline.
- Recording lectures without the explicit consent of the Professor or TA is grounds for academic discipline.
- Course content created by a faculty member is considered the faculty member's intellectual property; it should not be distributed, shared in any public domain, or sold by a student or other third party without prior written consent of the faculty member.

5. Methods of Evaluation

Grading Scheme and Assessment Dates

The overall course grade will be calculated as listed below:

Assignments:	15%
Midterm Test:	35%
Final Exam:	50%

Assignments

An assignment will be due each Friday of the semester at **11:55pm EDT**, with the exception of the first day of class (Friday, September 6th), the Friday of Fall Break week (Friday, October 18th), and the Friday in the week before the midterm (Friday, November 8th - based on the proposed midterm date). Each assignment will contain problems from the material covered in the course since the previous assignment, or one week before the deadline and will be available for a week before the deadline. The weekly assignment will either be a WeBWorK assignment or a written assignment. See below for more information on the two types of assignments.

WeBWorK Assignments

Most weeks, the assignment will be an online assignment which will run on the WeBWorK website. Students can work on the WeBWorK assignment at any time during the window with no time limit. Students will have unlimited attempts to complete each assignment before the assignment deadline; the questions in each attempt will be randomly generated from question pools and may differ from others'. Of these attempts, the highest mark will be recorded as the student's assignment grade.

Written Assignments

Three or four of the assignments will be written assignments. Written assignments need to be uploaded to the Gradescope site for submission. For instructions on how to upload assignments on Gradescope, visit the course OWL Brightspace website.

Midterm Test

The midterm test will contain problems from the course content covered in the first seven weeks of the term. The tentative date for the midterm will be:

Sunday, November 10, 2:00-4:00pm.

There will be a makeup midterm exam for those who have been granted Academic Considerations for the midterm exam. The tentative date for the makeup midterm will be:

Sunday, November 17, 2:00-4:00pm.

Note that the date and time of the midterm and the makeup midterm will be finalized after they are reviewed by Exam Central. Both the midterm and the makeup midterm will be in-person exams which will take place on campus. The locations of the exams will be posted closer to the dates of these exams.

Final Exam

The final exam will cover all the course material with more focus on the last part of the course. It will be a three-hour long exam and will take place in-person during the final exam period: December 9-22, 2024. It will be scheduled by the Registrar's office.

General information about missed coursework

Students must familiarize themselves with the *University Policy on Academic Consideration – Undergraduate Students in First Entry Programs* posted on the Academic Calendar:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/academic_consideration_Sep24.pdf,

This policy does not apply to requests for Academic Consideration submitted for **attempted or completed work**, whether online or in person.

The policy also does not apply to students experiencing longer-term impacts on their academic responsibilities. These students should consult [Accessible Education](#).

For procedures on how to submit Academic Consideration requests, please see the information posted on the Office of the Registrar's webpage:

https://registrar.uwo.ca/academics/academic_considerations/

All requests for Academic Consideration must be made within 48 hours after the assessment date or submission deadline.

All Academic Consideration requests must include supporting documentation; however, recognizing that formal documentation may not be available in some extenuating circumstances, the policy allows students to make one Academic Consideration request **without supporting documentation** in this course. However, the following assessments are excluded from this, and therefore always require formal supporting documentation:

- **Final Exam** (Defined by policy)
- **Midterm** (Designated by the instructor as the one assessment that always requires documentation when requesting Academic Consideration)

If a student *mistakenly* submits their one allowed Academic Consideration request **without supporting documentation** for the assessments listed above or those in the **Coursework with Assessment Flexibility** section below, the request cannot be recalled and reapplied. This privilege is forfeited.

Evaluation Scheme for Missed Assessments

Assignments:

It will not be necessary to request Academic Consideration for assignments. The lowest two assignment grades will be dropped. For the remaining assignments, any grade that is less than the student's final exam grade will be replaced by the final exam grade. This includes any number of missed assignments. In other words, missed assignments and assignments with grades lower than the final exam will be reweighted to the final exam. Do not request Academic Consideration for missed assignments and do not inform your professor about missed assignments, as these adjustments will be done automatically.

Note: This means that there will be no reason to request an Academic Consideration without supporting documentation in this course. The midterm and final exam are ineligible and no Academic Considerations are required for assignments.

See also the **Coursework with Assessment Flexibility** section below for the 48 hour No-Late-Penalty Period for assignments, which allows you to hand in any assignment up to 48 hours late.

Midterm:

If you miss the midterm due to any circumstance, you must provide an academic consideration covering the date of the test. A makeup midterm will be available to those who are granted an academic consideration in the week following the midterm exam.

In cases where a student misses the midterm exam and the makeup midterm exam and can provide an academic consideration for both absences, the weight of the midterm will be transferred to the final exam.

Final Exam:

When a student misses the Final Exam, they are expected to contact the Academic Counselling office of their Faculty of Registration as soon as they can do so. The Academic Counselling office will assess the eligibility of the student to be granted an Academic Consideration. If an Academic Consideration has been granted, the student will be allowed to write the Special Examination (the name given by the University to a makeup Final Exam).

If a student misses the Final Exam and the Special Examination and has been granted Academic Consideration for both exams, the date of the next Special Examination (if another Academic Consideration is granted) normally will be the scheduled date for the final exam the next time this course is offered. The maximum course load for that term will be reduced by the credit of the course(s) for which the final examination has been deferred.

See the Academic Calendar for details (under [Special Examinations](#)), especially for those who miss multiple final exams within one examination period.

Coursework with Assessment Flexibility

By policy, instructors may deny Academic Consideration requests for the following assessments with built-in flexibility:

Flexible Completion:

Assignments: This course has 11 Assignments, and the 9 assignments with the highest marks are counted towards your final grade. Should extenuating circumstances arise, students do not need to request Academic Consideration for the first 2 missed assignments. Academic consideration requests will be denied for the first 2 missed assignments. It will not be necessary to request Academic Considerations for any additional missed assignments. These additional missed assignments will be automatically transferred to the final exam.

Deadline with a No-Late-Penalty Period

Assignments. Students are expected to submit each of the 11 assignments by the deadline listed. Should extenuating circumstances arise, students do not need to request Academic Consideration and they are permitted to submit their assignment up to 48 hours past the deadline without a late penalty. After the No-Late-Penalty period, assignments will not be accepted and will be considered to be missed. As already stated, there is no reason to request Academic Considerations. If a student has missed more than 2 assignments, and has failed to submit any subsequent assignment by the end of the No-Late-Penalty Period, the weight of that missed assignment will be automatically transferred to the final exam.

6. Additional Statements

Religious Accommodation

When conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request an accommodation for their absence in writing to the course instructor and/or the Academic Advising office of their Faculty of Registration. This notice should be made as early as possible but not later than two weeks prior to the writing of the examination (or one week prior to the writing of the test).

Please visit the Diversity Calendars posted on our university's EDID website for the recognized religious holidays:

<https://www.edi.uwo.ca>.

Accommodation Policies

Students with disabilities are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf.

Academic Policies

The website for Registrar Services is <https://www.registrar.uwo.ca/>.

In accordance with policy,

https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf,

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 their official university address is attended to in a timely manner.

NO calculators or other electronic devices or any other aids are allowed on tests and exams.

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf.

Scholastic offences include: Copying solutions from other students, online sources, textbooks, etc.; showing your work to other students; uploading questions or solutions to a web site; and accessing a web site used for providing solutions (even if you do not use any solutions on the site).

The **penalty** for an academic offence involving a midterm or final will be a **failing grade in the course**. The **penalty** for each academic offence involving homework will be a grade of 0 on the homework set as well as a penalty of **negative 5% on the overall course grade**.

In some cases, the penalty can include expulsion from the program. All academic offences are added to your student record.

Only in the event of a university-declared emergency requiring some or all of the course to be delivered online: the tests and examinations in that period 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>.

Support Services

Please visit the Science & Basic Medical Sciences Academic Advising webpage for information on adding/dropping courses, academic considerations for absences, appeals, exam conflicts, and many other academic-related matters: <https://www.uwo.ca/sci/counselling/>.

Students who are in emotional/mental distress should refer to Mental Health@Western (<https://uwo.ca/health/>) for a complete list of options about how to obtain help.

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts at

https://www.uwo.ca/health/student_support/survivor_support/get-help.html.

To connect with a case manager or set up an appointment, please contact support@uwo.ca.

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 Accessible Education at

http://academicsupport.uwo.ca/accessible_education/index.html

if you have any questions regarding accommodations.

Learning-skills counsellors at Learning Development and Success (<https://learning.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 counselling.

Western University is committed to a thriving campus as we deliver our courses in the mixed model of both virtual and face-to-face formats. We encourage you to check out the Digital Student Experience website to manage your academics and well-being: <https://www.uwo.ca/se/digital/>.

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