

# Matrix Theory and Linear Algebra I Syllabus

Department of Mathematics & Statistics

MATH 1030 (Fall 2023)

*Dalhousie University acknowledges that we are in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq People and pays respect to the Indigenous knowledge held by the Mi'kmaq People, and to the wisdom of their Elders past and present. The Mi'kmaq People signed Peace and Friendship Treaties with the Crown, and section 35 of the Constitution Act, 1982 recognizes and affirms Aboriginal and Treaty rights. We are all Treaty people.*

*Dalhousie University also acknowledges the histories, contributions, and legacies of African Nova Scotians, who have been here for over 400 years.*

## Course Instructor(s)

Name	Email	Office Hours
Suresh Eswarathasan	sr766936@dal.ca	TBD, Chase 316
Various tutorial leaders have been assigned via the Registrar's Office		

## Course Description

*This course is a self-contained introduction to Matrix Theory and Linear Algebra. Topics include: subspaces, linear transformations, determinants, eigenvalues and eigenvectors, systems of linear equations.*

*Course Prerequisites: Nova Scotia advanced Mathematics 11 or 12*

## Student Resources

Office Hours to be held in Chase 316 with the exact times and dates to be determined. The various tutorial leaders will also have individual office hours; for those, please inquire directly with them.

The MATH/STAT Learning Centre is located in Chase 119 and will be operating in-person and remotely. It opens on Sept. 5 and support is available Monday through Friday from 11:30am - 4:30pm and Monday through Friday evenings from 6:30-7:30pm, until Dec. 19. Register for the Brightspace "course" at <https://www.dal.ca/faculty/science/math-stats/about/learning-centre.html>

## Course Structure

*Course Delivery:* Tentatively, The course will be delivered in-person and not be recorded. Lecture notes and worksheets will be uploaded regularly.

*Lectures:* Mondays, Tuesdays, and Thursdays in Marion McCain, Auditorium 1 @ 10:30am-11:20am

*Tutorials:* These will be held once a week during the semester (students must register at the beginning of the semester for a time/location) and will **start the week of September 18 2023**. Practice problems will be given, additional topics covered, and quizzes administered. Attendance is mandatory.

## Course Materials

- Textbook: "Matrix Theory and Linear Algebra" by Peter Selinger. This is an open textbook available for free download on Brightspace. You can also order a printed copy from Lulu.com.
- Course website on Brightspace is accessed through [dal.brightspace.com](https://dal.brightspace.com)

## Assessment

Assignments: Homework - 15% of grade, Completed online (via the Webwork interface) and accessed via Brightspace.

### Midterms/Quizzes:

- Midterm 1 = 20% of grade, Wednesday October 4, 7:00–8:30pm, Marion McCain Auditorium 2 (Ondaatje Hall)
- Midterm 2 = 20% of grade, Wednesday, November 8, 7:00–8:30pm, McCain Auditorium 2 (Ondaatje Hall)
- Quizzes = 5% of grade, administered in weekly tutorial sessions

*Final Exam:* 40% of final grade, 3 hours in length – Scheduled by the Registrar. Students must pass the final exam in order to pass the course.

Conversion of numerical grades to final letter grades follows the  
Dalhousie Grade Scale

A+ (90-100)	B+ (77-79)	C+ (65-69)	D (50-54)
A (85-89)	B (73-76)	C (60-64)	F (0-49)
A- (80-84)	B- (70-72)	C- (55-59)	

## Course Policies on Missed or Late Academic Requirements

1. Late homework will not be accepted except with the instructor's prior permission. Extensions can be given under certain conditions; see 3. below.
2. A missed midterm cannot be written at another time. If you miss the midterm without prior permission, then it will count as a 0. Exceptions are made in two cases: (1) if you obtain the instructor's prior permission to miss a midterm, or (2) if you have an officially valid and truthful excuse such as a medical or religious reason (as of July 1 2023, **physicians in Nova Scotia are not permitted to write 'doctor's notes'** for illnesses lasting fewer than 5 days). In these cases, the weight of the missed midterm will be shifted to the final exam (e.g., the final exam will then count 60% instead of 40%). There is no

make-up option for the final exam except in cases of an officially valid excuse per University regulations.

3. Student Declaration of Absence forms will be accepted for missed homework and quizzes, but not midterms or the final exam. Extensions can be given for missed homework and arrangements for missed quizzes can be worked out with the corresponding tutorial leaders. Only the best 8 of 10 quizzes will be counted.

### **Course Policies related to Academic Integrity**

1. Students are encouraged to study in groups, but each student must complete their own online homework, quizzes, and exams.
2. Calculators, textbooks, and notes are not permitted for Midterm Tests or the Final Examination.

### **Learning Objectives**

Students will learn the basic concepts of linear algebra, including the qualitative and quantitative solution of linear systems, vector operations, matrix operations and matrix algebra, rank and determinant, linear transformations, eigenvalues and eigenvectors, linear independence and dependence, subspaces and spanning sets, bases and dimension.

### **Course Content**

The following schedule is tentative:

September 5–8: 1.1–1.2 Systems of linear equations

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September 11–15: 1.3–1.5 Systems of linear equations

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September 18–22: SEPTEMBER 18 – TUTORIALS START  
1.6–1.8 Systems of linear equations, fields

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September 25–27: 2.1–2.5 Vectors in  $R^n$

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Oct 2 – Oct 6: OCTOBER 4 – LAST DAY TO DROP WITHOUT “W”  
OCTOBER 8, TUESDAY – FIRST MIDTERM, 7:00–8:30pm, ONDAATJE HALL  
2.6–2.7 Dot product, projections, cross product

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October 9–13: 4.1–4.9 Matrix arithmetic, inverses  
OCTOBER 13, FRIDAY – MONDAY TUTORIALS HELD IN LIEU OF THANKSGIVING

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October 16–20: 5.1–5.2 Span and linear independence

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October 23–27: 5.3–5.5 Subspaces and basis

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Oct 30 – Nov 3: 6.1–6.4 Linear transformations

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November 6 – 10: 7.1–7.5 Determinants  
NOVEMBER 8, WEDNESDAY – SECOND MIDTERM, 7:00–8:30pm, ONDAATJE HALL

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November 13–17: STUDY BREAK (NO CLASS)

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November 20–24: 8.1–8.4 Eigenvectors and eigenvalues, diagonalization

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November 27–31: 8.5–8.9 Applications

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December 4–8: Review  
DECEMBER 5, TUESDAY – FOLLOWS MONDAY SCHEDULE  
DECEMBER 6, WEDNESDAY – LAST DAY OF CLASSES, FOLLOWS MONDAY  
SCHEDULE

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## University Policies and Statements

### Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel, and support. Visit or e-mail the Indigenous Student Centre at 1321 Edward St or [elders@dal.ca](mailto:elders@dal.ca). Additional information regarding the Indigenous Student Centre can be found at: [https://www.dal.ca/campus\\_life/communities/indigenous.html](https://www.dal.ca/campus_life/communities/indigenous.html)

### Internationalization

At Dalhousie, 'thinking and acting globally' enhances the quality and impact of education, supporting learning that is "interdisciplinary, cross-cultural, global in reach, and orientated toward solving problems that extend across national borders." Additional internationalization information can be found at: <https://www.dal.ca/about-dal/internationalization.html>

### Academic Integrity

At Dalhousie University, we are guided in all our work by the values of academic integrity: honesty, trust, fairness, responsibility, and respect. As a student, you are required to demonstrate these values in all the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity. Additional academic integrity information can be found at: [https://www.dal.ca/dept/university\\_secretariat/academic-integrity.html](https://www.dal.ca/dept/university_secretariat/academic-integrity.html)

### Accessibility

The Student Accessibility Centre is Dalhousie's centre of expertise for matters related to student accessibility and accommodation. If there are aspects of the design, instruction, and/or experiences within this course (online or in-person) that result in barriers to your inclusion, please contact the Student Accessibility Centre ([https://www.dal.ca/campus\\_life/academic-support/accessibility.html](https://www.dal.ca/campus_life/academic-support/accessibility.html)) for all courses offered by Dalhousie with the exception of Truro. For courses offered by the

Faculty of Agriculture, please contact the Student Success Centre in Truro  
(<https://www.dal.ca/about-dal/agricultural-campus/student-success-centre.html>)

## **Conduct in the Classroom – Culture of Respect**

Substantial and constructive dialogue on challenging issues is an important part of academic inquiry and exchange. It requires willingness to listen and tolerance of opposing points of view. Consideration of individual differences and alternative viewpoints is required of all class members, towards each other, towards instructors, and towards guest speakers. While expressions of differing perspectives are welcome and encouraged, the words and language used should remain within acceptable bounds of civility and respect.

## **Diversity and Inclusion – Culture of Respect**

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness (Strategic Priority 5.2). Additional diversity and inclusion information can be found at: <http://www.dal.ca/cultureofrespect.html>

## **Student Code of Conduct**

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner - perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution. The full Code of Student Conduct can be found at:  
[https://www.dal.ca/dept/university\\_secretariat/policies/student-life/code-of-student-conduct.html](https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html)

## **Fair Dealing Policy**

The Dalhousie University Fair Dealing Policy provides guidance for the limited use of copyright protected material without the risk of infringement and without having to

seek the permission of copyright owners. It is intended to provide a balance between the rights of creators and the rights of users at Dalhousie. Additional information regarding the Fair Dealing Policy can be found at:  
[https://www.dal.ca/dept/university\\_secretariat/policies/academic/fair-dealing-policy-.html](https://www.dal.ca/dept/university_secretariat/policies/academic/fair-dealing-policy-.html)

### **Originality Checking Software**

The course instructor may use Dalhousie's approved originality checking software and Google to check the originality of any work submitted for credit, in accordance with the Student Submission of Assignments and Use of Originality Checking Software Policy. Students are free, without penalty of grade, to choose an alternative method of attesting to the authenticity of their work and must inform the instructor no later than the last day to add/drop classes of their intent to choose an alternate method. Additional information regarding Originality Checking Software can be found at:  
[https://www.dal.ca/dept/university\\_secretariat/policies/academic/student-submission-of-assignments-and-use-of-originality-checking-software-policy-.html](https://www.dal.ca/dept/university_secretariat/policies/academic/student-submission-of-assignments-and-use-of-originality-checking-software-policy-.html)

### **Student Use of Course Materials**

Course materials are designed for use as part of this course at Dalhousie University and are the property of the instructor unless otherwise stated. Third party copyrighted materials (such as books, journal articles, music, videos, etc.) have either been licensed for use in this course or fall under an exception or limitation in Canadian Copyright law. Copying this course material for distribution (e.g. uploading to a commercial third-party website) may lead to a violation of Copyright law.