

Faculty of Science Course Syllabus

Department of Mathematics and Statistics

Math 1030

Matrix Theory and Linear Algebra I

Winter 2024

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 knowledges 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

Section	Instructor	E-mail Address	Office Hours
01	Rob Noble	rnoble@dal.ca	MWF 2:30 PM – 3:30 PM in Chase 205

Course Description

This course is a self-contained introduction to Matrix Theory and Linear Algebra. Topics include: systems of linear equations, vectors in \mathbb{R}^n , matrices, spans, linear independence, bases, dimension, linear transformations in \mathbb{R}^n , determinants, eigenvalues and eigenvectors, diagonalization, applications.

Course Prerequisites

Nova Scotia Advanced Mathematics 11 or 12 (or equivalent)

Course Exclusions

MATH 2030.03

Student Resources

- The **MATH/STAT Learning Centre** is located in Chase 119 and will be operating in-person and remotely. It opens on January 8, 2024 and support is available Monday through Friday from 11:30 AM – 4:30 PM and Monday through Friday evenings from 6:30 PM – 7:30 PM, until April 23, 2024. Register for the Brightspace “course” at <https://www.dal.ca/faculty/science/math-stats/about/learning-centre.html> to access the online support and see the latest schedule.

Course Structure

Course Delivery

In person (not recorded).

Lectures

Section	Days	Time	Location
01	MWF	10:35 AM – 11:25 AM	MCCAIN ARTS&SS AUD-1

Tutorials

Section	Day	Time	Location
T01	T	4:35 PM – 5:25 PM	CHEMISTRY 223
T02	F	1:35 PM – 2:25 PM	CHEMISTRY 223
T03	R	3:35 PM – 4:25 PM	LSC-COMMON AREA C206
T04	M	4:35 PM – 5:25 PM	CHEMISTRY 223
T05	M	3:35 PM – 4:25 PM	CHEMISTRY 223

- Tutorials begin the week of January 15, 2024.
- Tutorials will not be held during study break or during weeks in which there is a scheduled university closure: There will be no tutorials held during the following weeks: January 29 – February 2, February 19 – 23, March 25 – 29.

Course Materials

- Textbook: “Matrix Theory and Linear Algebra” by Peter Selinger. This is an open textbook available for free download at <https://www.mathstat.dal.ca/~selinger/linear-algebra/>. You can also order a printed copy from Lulu.com.
- Course website on Brightspace is accessed through <https://dal.brightspace.com/d2l/login>.

Assessment

The final grade will be computed as the maximum of the grades obtained from the following two schemes:

Scheme I:

Component	Weight (% of final grade)	Date
Tutorial Quizzes	5%	Weekly
Midterm Exam	25%	February 27, 2024 (6:30 PM – 8:30 PM)
Final Exam	50%	(Scheduled exam period)
Online Assignments	20%	~3 per week

Scheme II:

Component	Weight (% of final grade)	Date
Tutorial Quizzes	5%	Weekly
Final Exam	75%	(Scheduled exam period)
Online Assignments	20%	~3 per week

Note: It is strongly recommended that you prepare yourself to be graded on the first scheme; the second scheme is included in order to accommodate students who fail to perform up to their ability on the midterm due to circumstances beyond their control.

Conversion of numerical grades to final letter grades follows the [Dalhousie Grade Scale](#).

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

General Course Policies

- On exams, we recommend that answers be left in unsimplified form.
- Calculators will NOT be allowed during tutorial quizzes, the midterm or the final examination. In fact, only writing utensils (pencils, lead, erasers, pens, white-out) will be allowed.
- Information about the course may be given during class. It is the responsibility of the students to ensure that they are made aware of what occurs during classes.

Course Policies on Missed or Late Academic Requirements

- Missed midterms or final exams can be made up, at the discretion of the course instructor for illness or equivalent official inability to write at the scheduled time and place. Please contact your instructor for more information or to request permission to write the scheduled make-up midterm or final exam.
- Missed tutorial quizzes **cannot be made up** under any circumstances. However, [Student Declaration of Absence forms](#) (maximum of 2) will be accepted for missed tutorial quizzes. SDAs should be completed, signed and e-mailed to Dr. Noble (rnoble@dal.ca) within 3 days of the missed tutorial.

Course Policies related to Academic Integrity

- Students are permitted to work together on the online assignments.
- No collaboration is permitted on tutorial quizzes, the midterm nor the final exam.

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

Date	Topic	Tutorial
January 8 – 12	1.1–1.3 Systems of linear equations	No tutorials
January 15 – 19	1.4–1.5 Systems of linear equations	Tutorial 1
January 22 – 26	1.6–1.8 Systems of linear equations, fields	Tutorial 2
January 29, 31	2.1–2.5 Vectors in \mathbb{R}^n	No tutorials
February 2	Munro Day – No Class	
February 5 – 9	2.6–2.7 Dot product, projections, cross product	Tutorial 3
February 12 – 16	4.1–4.8 Matrix arithmetic, inverses	Tutorial 4
February 19 – 23	Study Break – No Classes	No tutorials
February 26 – March 1	5.1–5.2 Span and linear independence	Tutorial 5
February 27	Midterm (6:30 PM – 8:30 PM)	
March 4 – 8	5.3–5.5 Subspaces and basis	Tutorial 6
March 11 – 15	6.1–6.4 Linear transformations	Tutorial 7
March 18 – 22	7.1–7.5 Determinants	Tutorial 8
March 25, 27	8.1–8.4 Eigenvectors and eigenvalues, diagonalization	No tutorials
March 29	Good Friday – No Class	
April 1 – 5	8.5–8.9 Applications	Tutorial 9
April 8, 9	Review / “Catch-up” time	

*Classes on April 8 and April 9 follow a Friday schedule.

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. Additional information regarding the Indigenous Student Centre can be found at: 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

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) 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

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

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

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.

Student Resources and Support

University Policies and Programs

Important Dates in the Academic Year (including add/drop dates): http://www.dal.ca/academics/important_dates.html

Classroom Recording Protocol: https://www.dal.ca/dept/university_secretariat/policies/academic/classroom-recording-protocol.html

Dalhousie Grading Practices Policies: https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html

Grade Appeal Process: https://www.dal.ca/campus_life/academic-support/grades-and-student-records/appealing-a-grade.html

Sexualized Violence Policy: https://www.dal.ca/dept/university_secretariat/policies/health-and-safety/sexualized-violence-policy.html

Scent-Free Program: <https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html>

Learning and Support Resources

General Academic Support - Advising (Halifax): https://www.dal.ca/campus_life/academic-support/advising.html

General Academic Support - Advising (Truro): <https://www.dal.ca/about-dal/agricultural-campus/ssc/academic-support/advising.html>

Student Health & Wellness Centre: https://www.dal.ca/campus_life/health-and-wellness.html

On Track (helps you transition into university, and supports you through your first year at Dalhousie and beyond): https://www.dal.ca/campus_life/academic-support/On-track.html

Indigenous Student Centre: https://www.dal.ca/campus_life/communities/indigenous.html

Indigenous Connection: <https://www.dal.ca/about-dal/indigenous-connection.html>

Elders-in-Residence (The Elders in Residence program provides students with access to First Nations elders for guidance, counsel, and support. Visit the office in the Indigenous Student Centre or contact the program at elders@dal.ca or 902-494-6803: <https://cdn.dal.ca/content/dam/dalhousie/pdf/academics/UG/indigenous-studies/Elder-Protocol-July2018.pdf>

Black Student Advising Centre: https://www.dal.ca/campus_life/communities/black-student-advising.html

International Centre: https://www.dal.ca/campus_life/international-centre.html

South House Sexual and Gender Resource Centre: <https://southhousehalifax.ca/about/>

LGBTQ2SIA+ Collaborative: <https://www.dal.ca/dept/vpei/edia/education/community-specific-spaces/LGBTQ2SIA-collaborative.html>

Dalhousie Libraries: <http://libraries.dal.ca/>

Copyright Office: <https://libraries.dal.ca/services/copyright-office.html>

Dalhousie Student Advocacy Services: <https://www.dsu.ca/dsas?rq=student%20advocacy>

Dalhousie Ombudsperson: https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html

Human Rights and Equity Services: <https://www.dal.ca/dept/hres.html>

Writing Centre: https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html

Study Skills/Tutoring: http://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html

Faculty of Science Advising Support: <https://www.dal.ca/faculty/science/current-students/undergrad-students/degree-planning.html>

Safety

Biosafety: <http://www.dal.ca/dept/safety/programs-services/biosafety.html>

Chemical Safety: <https://www.dal.ca/dept/safety/programs-services/chemical-safety.html>

Radiation Safety: <http://www.dal.ca/dept/safety/programs-services/radiation-safety.html>

Laser Safety: <https://www.dal.ca/dept/safety/programs-services/radiation-safety/laser-safety.html>