

We recognize and acknowledge that McMaster University meets and learns on the traditional territories of the Mississauga and Haudenosaunee nations, and within the lands protected by the "[Dish With One Spoon](#)" wampum, an agreement amongst all allied Nations to peaceably share and care for the resources around the Great Lakes.

MATH 2LA3 – Applications of Linear Algebra 2023 Summer Term

Instructor: [Craig Kohne](#) | **E-mail:** kohnec@math.mcmaster.ca | **Office Hours:** TBA

Course Description

This course focuses on applications of linear algebra. Topics include linear programming, applications of matrix decomposition theorems, examples from data science, singular value decomposition and applications to compression.

Prerequisite(s): One of MATH 1AA3, 1LT3, 1NN3, 1XX3, 1ZB3, ARTSSCI 1D06 A/B, ISCI 1A24 A/B; and one of MATH 1B03, 1ZC3, 1ZZ5

Course Webpage

All course content and updates will be found on the course's Avenue to Learn page.

A static webpage for the course: <https://ms.mcmaster.ca/kohnec/2LA3/>

Course Meeting Time

The class will meet in-person in BSB 147 from 7:00 to 10:00pm on Tuesdays and Thursdays.

The first meeting will be on June 20.

Required Materials/ Resources

Textbook

Lay, Lay, and McDonald, Linear Algebra and Its Applications, 6th edition.



Course Overview and Assessment

These are the main topics of the course (with reference to the relevant chapters of the textbook):

- Review of first year linear algebra. (parts of chapters 1-5)
- Orthogonality, orthogonal bases, Gram-Schmidt, QR factorization, projections, least squares, normal equations. (6.1-6.5)
- Symmetric and orthogonal matrices, orthogonal diagonalization, spectral theorem, quadratic forms, positive definite matrices, constrained optimization. (7.1-7.3)
- Singular value decomposition, applications of the SVD to statistics (principal components) and data compression. (7.4-7.5) Eckart-Young theorem, low rank approximation (not in book)
- Linear programming: graphical method (9.2), simplex method (9.3).

Test/Exam Dates (tentative)

- There will two 75 minute in-person term tests: one on July 4 and one on July 18.
- There will be a 2.5 hour in-person final exam on August 3.

Allowed Test/Exam Aids

- A McMaster standard calculator (Casio fx-991 or Casio fx-991 MS) is allowed.
- One piece of paper (8.5x11in) with notes is allowed. Students can put any information about the course content on both sides of this paper.

Course Evaluation

Grade Component	Option 1	Option 2
Assignments	20%	20%
Tests	40% (20% each)	20% (best of 2)
Final (Aug 3)	40%	60%

Your final grade will be the maximum of Option 1 and Option 2. If you use the MSAF for a test or assignment, the weighting of the missed work will be transferred to the final exam.

You must write (at least) one of the term tests and the exam to complete the course.



Assignments

We are using the online system Crowdmark for assignments. There will be a total of 6 assignments.

Comparison with MATH 2R03

This course's primary concern will be applications of linear algebra. Math 2R03 is a more theoretical development of linear algebra and is offered in winter term. At least one (you can take both) of Math 2LA3 or Math 2R03 is required for all Honours Math and Stats programmes. Math 2R03 is required for Honours Math and Stats with a Mathematics subplan. Either linear algebra course is an allowable prerequisite for most third year Math and Stats courses. For Math 3A03, Math 3B03, Math 3GR3, Math 3F03, Math 3FF3 and Math 3QC3, the requirement is Math 2R03 or a grade of at least of B+ in Math 2LA3 (this change will occur in 2022-23).

Requests for Relief for Missed Academic Term Work

[McMaster Student Absence Form \(MSAF\)](#): In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar "Requests for Relief for Missed Academic Term Work".

Academic Accommodation of Students with Disabilities

Students with disabilities who require academic accommodation must contact [Student Accessibility Services \(SAS\)](#) at 905-525-9140 ext. 28652 or sas@mcmaster.ca to make arrangements with a Program Coordinator. For further information, consult McMaster University's [Academic Accommodation of Students with Disabilities](#) policy.

Academic Accommodation for Religious, Indigenous Or Spiritual Observances (Riso)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the [RISO](#) policy. Students should submit their request to their Faculty Office **normally within 10 working days** of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.



Courses with An On-Line Element

Some courses may use on-line elements (e.g. e-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure, please discuss this with the course instructor.

Academic Integrity

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

It is your responsibility to understand what constitutes academic dishonesty.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: “Grade of F assigned for academic dishonesty”), and/or suspension or expulsion from the university. For information on the various types of academic dishonesty please refer to the [Academic Integrity Policy](https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/), located at <https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/>

The following illustrates only three forms of academic dishonesty:

- plagiarism, e.g. the submission of work that is not one’s own or for which other credit has been obtained.
- improper collaboration in group work.
- copying or using unauthorized aids in tests and examinations.

Authenticity / Plagiarism Detection

Some courses may use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work

electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. **All submitted work is subject to normal verification that standards of academic integrity have been upheld** (e.g., on-line search, other software, etc.). For more details about McMaster's use of Turnitin.com please go to the [McMaster Office of Academic Integrity's](#) webpage.

Conduct Expectations

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all our living, learning and working communities. These expectations are described in the [Code of Student Rights & Responsibilities \(the "Code"\)](#). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, **whether in person or online**.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

Additional information about the Code and netiquette can be found [here](#).

Copyright and Recording

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, **including lectures** by University instructors.

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

Extreme Circumstances

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.