

**MAT246 2024F LEC0201:
CONCEPTS IN ABSTRACT MATHEMATICS
TUESDAY 13:00-15:00, THURSDAY 13:00-14:00
(ALL LECTURES IN MP 102)
COURSE SYLLABUS (PROVISIONAL)**

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TAS: FEDERICO MANGANELLO, DOMINIC SHILLINGFORD

CONTENTS

1. Goals	1
2. Prerequisites	1
3. Format	2
4. Syllabus	2
5. Text	2
6. Tests and marking scheme	2
7. Policies	3
8. Institutional Policies and Support	4
8.1. Academic Integrity.	4
8.2. Accessibility.	4

1. GOALS

The goal of this course is to introduce students to mathematical proofs and abstract mathematical concepts. Both are well illustrated on topics taken from Linear Algebra, which is a core discipline in mathematics and its various applications, all the way to internet search engines and GPS. In the setting of Linear Algebra, we will learn about rigorous definitions, statements and proofs, and about abstract arguments.

2. PREREQUISITES

The following courses are prerequisites for MAT246:
MAT133Y1 / MAT133Y5 / (MATA32H3, MATA33H3) / (MAT135H1, MAT136H1)
/ (MAT135H5, MAT136H5) / (MATA30H3/ MATA31H3, MATA36H3 / MATA37H3)
/ MAT137Y1 / MAT137Y5/ (MAT137H5, MAT139H5), MAT223H1 / MATA22H3
/ MATA23H3 / MAT240H1 / MAT240H5

Date: September, 2024.

3. FORMAT

Weekly lectures and tutorials / office hours (to be announced).

4. SYLLABUS

- (1) Vector spaces
- (2) Span and bases
- (3) Linear maps
- (4) Inner product spaces
- (5) Change of bases
- (6) Introduction to complex numbers
- (7) The fundamental theorem of algebra and factoring polynomials
- (8) Spectrum and evolution
- (9) Eigenvalues and eigenvectors
- (10) Permutations and the determinant of a square matrix
- (11) The spectral theory for normal linear maps

5. TEXT

I. Lankham, B. Nachtergaele, A. Schilling. Linear Algebra as an Introduction to Abstract Mathematics

Available at https://www.math.ucdavis.edu/~anne/linear_algebra/mat67_course_notes.pdf

6. TESTS AND MARKING SCHEME

We will have ten quizzes (40 minutes each), a midterm test (2 hours) and final assessment (2 hours).

The quizzes will be held during the regular class hours and the regular class locations on Thursdays. The quizzes will be held on the following dates: September 12, 19, 26, October 3, 10, 17, 24, November 14, 21, 28.

The midterm will be held on Tuesday, November 5 during the regular 2-hour class.

The final assessment will be held during the final assessment period in December 2024 and will be scheduled by the registrar. Information about the format will be provided during the Fall semester.

Quizzes, and midterm test and final assessment will be on the material covered in the lectures. Most of the problems for the quizzes, midterm test and the final

assessment will be taken (with small modifications) from the homework. The problems in quizzes and exams will involve proofs.

Location and time: The quizzes and midterm test will be held during scheduled class time in the scheduled lecture room.

Remarking Policy. A student who believes an individual item of work has been incorrectly or unfairly marked may ask the TA who marked it for a re-evaluation. With evidence to back their appeal, students should make such requests within 5 days after receiving the work back.

Breakup of the grade:

Quizzes – 50%; midterm test – 10%; final assessment – 40%.

7. POLICIES

Email Policy. Email may be used should you have a question that is not answered on the course site on Quercus. Questions should be sent first to the TAs. If they are not able to answer the question, they will forward them to the instructor. Please note that all email communications with the instructor or TAs must be sent from your official Univ of Toronto email address, with the course number included in the subject line and sent to the dedicated email account (to be established). All questions regarding marking of term tests should be directed to the TAs. If these instructions are not followed, your email may not be responded to.

No Aids Policy. Aids are not allowed for any of the tests. Students' desks must not have any material on them other than the test booklet and pens and/or pencils. Any students who break this rule will get zero credit for the test in question.

Missed Test Policy. As the quizzes and midterm are scheduled during regular class time and in the usual lecture room, it is expected that students will not have scheduling conflicts.

The 6 quizzes/midterm with the lowest marks (including missed quizzes/midterm) will be discarded. The midterm will count as 2 quizzes.

There will be *no make-ups* for missed quizzes or missed midterm.

Ask questions during lectures. If you have questions during the lectures, ask at the time the question occurs, or at the end of the lecture. But please do not ask questions privately after the lecture or during the break. I would like everyone in the class to hear my answers to questions. If a question occurs to you after the class is over, ask the TAs or save it for the next class.

8. INSTITUTIONAL POLICIES AND SUPPORT

Academic Integrity. All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters

(<https://governingcouncil.utoronto.ca/secretariat/policies/code-behaviour-academic-matters>)

Note that you are expected to seek out additional information on academic integrity from me or from other institutional resources (for example, the University of Toronto website on Academic Integrity <http://academicintegrity.utoronto.ca/>).

Accessibility. The University provides academic accommodations for students with disabilities in accordance with the terms of the Ontario Human Rights Code. This occurs through a collaborative process that acknowledges a collective obligation to develop an accessible learning environment that both meets the needs of students and preserves the essential academic requirements of the University's courses and programs. If you have a disability that may require accommodations, please approach the Accessibility Services office as soon as possible. The sooner you let us know your needs the quicker we can assist you in achieving your learning goals in this course.

Link to Accessibility Services website:

<https://studentlife.utoronto.ca/departments/accessibility-services/>