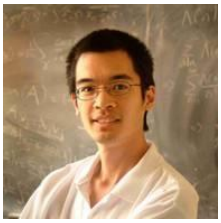
WESTERN UNIVERSITY
DEPARTMENT OF MATHEMATICS
LONDON, ONTARIO, CANADA **FALL 2018**

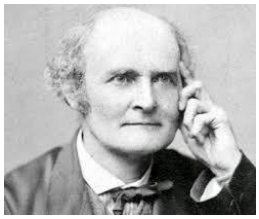

T. Tao


P. Scholze


K. Wickelgren


A. Venkatesh


J. Ellenberg


A. Cayley

ADVANCED LINEAR ALGEBRA[*] – Mathematics 3121A / 9050A
([*]Also known as the *Joy of Linearization and Amazing Adventures of Canonical, Beautiful Jordan Forms and More!)*

Instructor:	Ján Mináč (also known as Professor Maniac ☺)
Email:	minac@uwo.ca / and / jminac1811@gmail.com
Office Hours:	Will be discussed in class, but this will not be the main topic of the class. (My indoor office is in Middlesex College. Exercise 0: Determine the number of my office as the value $\left(\mathrm{Det}\begin{bmatrix}11 & 0\\ 0 & 11\end{bmatrix}\right)+10.$ (You can find the solution in the rotunda in Middlesex College.) I also use the university campus as a large, outdoor office. ☺
Office Telephone:	(519) 661-2111, extension 86519
Class Times:	MWF 11:30 a.m. – 12:30 p.m.
Class Location:	Middlesex College room 107
Prerequistes:	Previous knowledge of Math 2120A/B, and some very basic knowledge of linear algebra is also useful. Also an interest in the magic of mathematics is very welcome. The courage to try and write neat proofs will be encouraged. If you are unsure about the background, please speak with me or email me.
Evaluation:	Homework 60% and final examination 40%.
Some Questions Whose Answers we Master:	Why are rows and columns of numbers fascinating? What determines determinants? What is the meaning of diagonalizability? How is it connected with Einstein's theory of relativity? Can we discuss it all in Einstein's Café? ☺ What is the magic of Sylvester's Theorem?
Fun:	During the entire semester. ☺
Linear Algebra Claim:	Linear Algebra is delightful magic, filled with surprises and interesting, challenging theorems, problems, and relations with other areas of mathematics, arts, and science. (This claim will be proved in class.)
The Art of Studying and Research:	We shall discuss and practice.

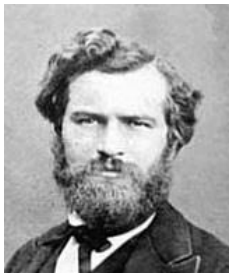
Textbook: *Linear Algebra, Fourth Edition*, by Stephen H. Friedberg, Arnold J. Insel and Lawrence E. Spence, Prentice Hall (Pearson Education, Inc.), 2003, ISBN 0-13-008451-4.

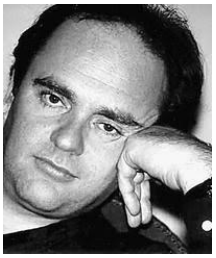
Note: I will request that the Taylor Library place their copy of this book on 2-hour reserve loan to be available for students taking this course.

This is a great book! It is available at the Western Book Store. (This book is optional – recommended but not required, as the main source of information will be your lecture notes.) This book contains a wealth of charming and beautiful mathematics explained in a clear and friendly way. We shall first concentrate on chapters 5, 6 and 7. What fun! What a source of pleasant surprises. Just wait and see! ☺

Course Description: This course is a continuation of the material covered in Mathematics 2120A/B; some of which includes: further properties of complex number fields, a recall of and extended material on diagonalizability and Eigenvalues and Eigenvectors, the spectral theorem, the Gram-Schmidt orthogonalization process; normal and self-adjoint operators; linear groups; similarity; Jordan canonical forms; the Cayley-Hamilton theorem; bilinear and quadratic forms; and Sylvester's theorem.


L. Euler


C. Jordan


A. Granville


J. Labute


R. Murty

This will be the core of this course which we shall try and develop with many details, and we shall aim at a full understanding of the basics.

In the other part of this course we shall bravely make an attempt to understand the "big picture" and the latest developments and connections with some other areas of mathematics including number theory, combinatorics, functional analysis, algebraic groups, K-theory, group representations, Fourier series, Hilbert spaces, and more. We shall climb some cool hills and enjoy possibly some spectacular and breathtaking views, depending partly upon the weather conditions. ☺

This course is a fantastic opportunity to mix undergraduate students with graduate students. We shall use this opportunity to embrace learning via wonderful interactions and also by presenting some material by graduate students. This will be a 'win-win' situation as opposed to a 'lose-lose' situation.


V. Horowitz

A Comment on the Evaluation of Student Performance (Math 3121A / Math 9050A):

Homework Assignments: The most important learning experience will be homework assignments given with various values assigned towards the final grade. The work done on these homework assignments will be essential for your mastery of the material, as well as great preparation for the final examination.

Learning mathematics is like learning to play the piano or to play soccer. *You cannot do it yourself without trying to play!* (For example I did watch great musicians play, including the great pianist, Vladimir Horowitz; but I still cannot play piano myself, as I never tried! But I have played soccer myself, and now I can (and I do)

play and enjoy soccer very much. (The basic soccer-playing skills do remain, but the power of running on the soccer field has gone down alarmingly lately.) ☺

Final Examination: There will also be one written final examination.

Final Examination Conflicts:

If you have a conflict with another final examination, you must contact the Registrar's Office as soon as possible to arrange a special time/place to write the final examination.

If you have three final examinations in 3 consecutive periods, you must contact the Dean of your faculty.

In all cases please let your instructor know.

If you miss the final examination due to illness, you must present a doctor's note to the appropriate Dean's Office, and you will be given a make-up final examination as soon as possible after the regular examination. If you are in this situation you should contact your instructor as soon as you realize that you will miss the exam. (Also see the University's policy on final examination conflicts:

https://www.uwo.ca/univsec/pdf/academic_policies/exam/conflicts.pdf).

Further Information:

Academic dishonesty: Scholastic offences are taken seriously and students are directed to read the official policy: https://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf. (See also the section "Scholastic discipline for undergraduate students" of the Academic Calendar.)

Accessibility Statement: Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111, extension 82147 for any specific question regarding an accommodation.

Support Services: Learning skills counsellors at the Student Development Centre (http://www.sdc.uwo.ca/) are ready to help you improve your learning skills. Students who are in emotional / mental distress should refer to Mental Health@Western for a complete list of options about how to obtain help. Additional student-run support services are offered by the University Students' Council (https://westernusc.ca/). The website for Registrarial Services is: http://www.registrar.uwo.ca.

Eligibility: You are responsible for ensuring that you have successfully completed all course prerequisites and that you have not taken an antirequisite course. Unless you have either the requisites for this course or written special permission from your Dean 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.