

**APPLIED LINEAR ALGEBRA**  
**MAT 3341 – FALL 2025**

**Instructor:** Diane Guignard (STM 523, [dguignar@uottawa.ca](mailto:dguignar@uottawa.ca))  
**Personal webpage:** <https://mysite.science.uottawa.ca/dguignar/>  
**Course webpage:** <https://uottawa.brightspace.com/d21/home> (Brightspace)  
**Classes:** Mo 4:00pm-5:20pm at 60 University (SMD), room 425  
We 2:30pm-3:50pm at 55 Laurier (DMS), room 1130  
**Office hours:** Tu 10:30am-12:30pm in STM 523  
or by appointment (in person or on Zoom)

Course-related material, such as homework exercises, lecture notes, and topics covered per course, will be posted on Brightspace. Important information might also be sent by emails.

**Textbook:**

Peter J. Olver and Chehrzad Shakiban, *Applied Linear Algebra*, 2<sup>nd</sup> edition, Springer, 2018.

A **free electronic version** is available online and can be obtained via the library of the University (<https://biblio.uottawa.ca/en>).

**Lecture notes:**

Lecture notes with the material covered in class will be posted on Brightspace.

**Catalog Description:**

Vector and matrix norms. Schur canonical form,  $QR$ ,  $LU$ , Cholesky and singular value decomposition, generalized inverses, Jordan form, Cayley-Hamilton theorem, matrix analysis and exponentials of matrices, eigenvalue estimation and the Gershgorin Circle Theorem; quadratic forms, Rayleigh and minima principles. This course includes proofs and applications of computational methods.

**Prerequisites:**

(MAT 1322 or MAT 1325), (MAT 2141 or MAT 2342).

**Course Outline (tentative):**

This course will cover the following topics (exact topics and order subject to changes). The numbers in parentheses indicates the corresponding sections in the textbook.

1. **Chapter 1: Linear Algebraic Systems**
  - 1.1 Matrix arithmetic (1.3-1.6)
  - 1.2 Gaussian elimination (1.3)
  - 1.3  $LU$  factorization and generalization (1.3-1.8)
2. **Chapter 2: Inner Products and Norms**
  - 2.1 Inner products and vector norms (3.1-3.3, 3.6)
  - 2.2 Matrix norms (3.3)
  - 2.3 Conditioning of a linear system
  - 2.4 Positive definite matrices and quadratic forms (3.4)
  - 2.5 Cholesky factorization (3.5)
3. **Chapter 3: Orthogonality**
  - 3.1 Orthogonal and orthonormal bases (4.1-4.2)
  - 3.2 Orthogonal matrices and  $QR$  factorization (4.3)
  - 3.3 Orthogonal projection (4.4)

- 3.4 Least Squares minimization problems (5.1-5.5)
- 4. **Chapter 4: Eigenvalues and Singular Values**
  - 5.1 Computing eigenvalues (8.2, 9.5)
  - 5.2 Diagonalization (8.3, 8.5)
  - 5.3 Jordan canonical form (8.6)
  - 5.4 Singular value decomposition and pseudoinverse (8.7)

### Homework:

Exercises will be posted weekly on Brightspace after Monday's lecture. These problems are not to be turned in and will not be graded. However, you are strongly encouraged to work on these problems to help consolidate and assimilate the material introduced in class (note that some of these problems may appear on a midterm and/or the final exam).

A few (optional) problems will require the use of a computer. What software you use it up to you, but Matlab/Octave will be used for the solutions as well as any given script/function that can be useful to solve these problems.

### Exams:

There will be two midterm exams and one final *comprehensive* exam. The midterms will take place on **Monday, October 6** and **Monday, November 17**, during the usual class time. The final exam will be held during the exam period (precise date to be determined). A detailed description of the material covered by each exam will be provided on Brightspace in due time.

### Grading Policy:

The final grade will be based on the two midterm exams and the *comprehensive* final exam. It will be computed according to the following distribution:

- Midterm I: 25% of your grade;
- Midterm II: 25% of your grade;
- Final exam: 50% of your grade.

Exam scores will be posted on Brightspace so you can monitor your progress in the course. If your score at the final exam is less than 40%, then your final letter grade will be F. Otherwise, your final letter grade will be computed according to the standard university scale:

A+ (90%-100%); A (85%-89%); A- (80%-84%); B+ (75%-79%); B (70%-74%); C+ (65%-69%); C (60%-64%); D+ (55%-59%); D (50%-54%); E (40%-49%); F (0%-39%).

### Important Dates:

Below is a summary of the important dates for the Fall 2025 term. You will find more information at the website

<https://www2.uottawa.ca/current-students/important-academic-dates-deadlines>

<b>September 3</b>	<b>First day of the term and first day of this class</b>
<b>October 6</b>	<b>Midterm I (4:00pm-5:20pm in SMD 425)</b>
October 12-18	Reading week (no classes)
October 13	Thanksgiving
<b>November 17</b>	<b>Midterm II (4:00pm-5:20pm in SMD 425)</b>
<b>December 1</b>	<b>Last day of this class</b>
December 2	Last day of the term
December 4-17	Exam period (date to be determined)

### Attendance Policy and Make-up Policy:

Attendance is STRONGLY recommended, but attendance will not be taken. There will be no

make-up for the midterms. However, if you miss a midterm for a valid reason, then its weight will be transferred to the final exam.

### **Materials Copyright:**

All materials generated for this class are protected by Copyright laws. Distributing copies or sale of any of these materials is strictly prohibited.

### **Academic Fraud:**

Academic fraud is an act by a student that may result in a false evaluation. It is not tolerated by the University. Examples of academic fraud are: plagiarism, cheating of any kind or submit a work for which you are not the author, in whole or part. Any person found guilty of academic fraud will be subject to severe sanctions. Please consult the webpage <https://www.uottawa.ca/vice-president-academic/academic-integrity/resources-students> which contains regulations and tool to help you avoid plagiarism.

### **Bilingualism:**

Except in programs and courses for which language is a requirement, all students have the right to produce their written work and to answer examination questions in the official language of their choice, regardless of the course's language of instruction.

### **Academic GPS:**

The Academic GPS hub is a one-stop shop for academic support. Whether you're an experienced student or just starting out, you'll find some great resources to help you succeed.

With the Academic GPS, you can:

- chat with a mentor seven days a week;
- register for study groups;
- take part in study methods workshops (note taking, time management, exam preparation, stress management, etc.);
- book an appointment with a mentor.

For more information: <https://www.uottawa.saea-tlss.ca/en/academic-gps>.

### **Health and Wellness:**

Your wellness is an integral part of your success. If you don't feel well, it can be hard to focus on your studies. Dedicated professionals and fellow students who care about you are always ready to provide advice and support. Depending on your needs, many activities and services exist to accompany you during your academic journey.

Services include:

- opportunities to connect;
- counselling sessions;
- peer support;
- physical activity;
- wellness activities and workshops;
- spiritual guidance.

If you want to connect with a counsellor, you can book an appointment online or go to their walk-in clinic at 100 Marie-Curie, fourth floor. You can also drop-in to our wellness space, chat online with a peer helper, or access 24/7 professional help through the website.

For more information and to access these services, go to <https://www.uottawa.ca/wellness>.

### **Academic Accommodations:**

We try to make sure all students with disabilities have equal access to learning and research environments, the physical campus and University-related programs and activities. The Academic Accommodations service works with other campus services to create an accessible campus learning environment, where students with disabilities have an equal opportunity to flourish.

We offer a wide range of services and resources, provided with expertise, professionalism and confidentiality.

Services include:

- help for students with disabilities in making the transition;
- permanent and temporary accommodation measures;
- learning strategy development;
- adaptive exams;
- transcriptions of learning material;
- interpretation (ASL and LSQ);
- assistive technologies.

If you think that you might need any of our services or supports, email the Academic Accommodations service ([adapt@uOttawa.ca](mailto:adapt@uOttawa.ca)).