



**INTRODUCTION TO NUMERICAL METHODS
MAT 3380 – WINTER 2024**

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Course webpage: <https://uottawa.brightspace.com/d21/home> (Brightspace)
Classes: Tu 4:00pm-5:20pm in 145 Jean-Jacq. Luss. (LMX), room 242
 Th 2:30pm-3:50pm in 145 Jean-Jacq. Luss. (LMX), room 242
Office hours: We 1:00pm-2:30pm in STM 523
 or by appointment (in person or on Zoom)

Course-related material, such as homework assignments or topics cover per course, will be posted on Brightspace. Important information might also be sent by emails.

Textbook:

A first course in numerical methods by U. M. Ascher & C. Greif, SIAM, 2011.

An electronic version is available free of charge via the library of the university, see <https://biblio.uottawa.ca/en>.

Lecture notes:

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

Catalog Description:

Roots of nonlinear equations (fixed point, Newton, secant, bisection). Condition number of linear systems. Iterative methods for linear and non-linear systems (Gauss-Seidel, Gauss-Jacobi, SOR; fixed point, Newton). Interpolation and polynomial approximation, numerical differentiation and integration. Numerical methods for differential equations. Error analysis.

Prerequisites:

MAT 2122, MAT 2125, (MAT 2141 or MAT 2342), (MAT 2324 or MAT 2384).

Course Objectives:

This course is an introductory survey of numerical methods that are used in science and engineering. We will analyze properties such as accuracy, efficiency and stability of classical numerical approximations. The homework will include programming exercises to gain practical experience using the methods introduced in class.

Course Outline and Schedule (tentative):

This course will cover the following topics from the textbook. The duration is tentative. Moreover, the exact topics will be covered as time allows.

Book Chapters	Sections	Duration
Introduction		0.5 week
3. Nonlinear Equations in One Variable	3.1-3.4	1.5 weeks
10. Polynomial Interpolation	10.1-10.7	1.5 weeks
11. Piecewise Polynomial Interpolation	11.2-11.3	0.5 weeks
14. Numerical Differentiation	14.1-14.2, 14.4	1.0 week
15. Numerical Integration	15.1-15.4	1.5 weeks
5. Linear Systems: Direct Methods	5.1-5.8, 4.2	1.5 weeks
7. Linear Systems: Iterative Techniques	7.1-7.4	2.0 weeks
16. Differential Equations	16.1-16.3, 16.5-16.6	1.5 week

Homework:

Exercises will be posted weekly on Brightspace. Throughout the term, there will be 5 assignments to be turned in on the assigned due date directly on Brightspace. Additional problems, usually extracted from the textbook, will be given for extra practice but are not to be turned in and will not be graded. You are encouraged to work with others while solving homework problems, but you must write up your own solutions. Moreover, late homework will not be accepted except in the case of an excused absence.

Some of the problems will require the use of a computer. What software you use is up to you, but solutions will only be given in Matlab/Octave.

Exams:

There will be one midterm exam and one final *comprehensive* exam. The midterm will take place Thursday, February 29 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 homework assignments, the midterm exam and the *comprehensive* final exam. It will be computed according to the following distribution:

- Homework: 20% of your grade;
- Midterm exam: 30% of your grade;
- Final exam: 50% of your grade.

Out of the five assignments, the lowest grade will be dropped (so 4 assignments out of 5 will count for the homework part). Homework and exam scores will be posted on Brightspace so you can monitor your progress in the course. If your score on the final exam is less than 50%, then your final letter grade will be F. Otherwise, your final letter grade will be computed according to the standard university scale, namely:

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 Winter 2024 term. You will find more informations at the website

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

January 8	First day of the term
January 9	First day of this class
February 18-24	Reading week (no classes)
February 29	Midterm (2:30pm-3:50pm in LMX 242)
March 29 - April 1	Easter break
April 4	Last day of this class
April 10	Last day of the term (redefined day, Saturday course schedule)
April 12-25	Exam period (date to be determined)

Attendance and Make-up Policy:

Attendance is STRONGLY recommended, but attendance will not be taken. There will be

no make-up for the midterm. However, if you miss the 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).