

**DEPARTMENT OF MATHEMATICAL AND COMPUTATIONAL SCIENCES
UNIVERSITY OF TORONTO MISSISSAUGA**

**CSC338H5S LEC0101
Numerical Methods
Course Outline - Winter 2020**

Class Location & Time	Wed, 03:00 PM - 05:00 PM IB 235
Instructor	Lisa Zhang
Office Location	DH3078
Office Hours	
E-mail Address	lczhang [at] cs [dot] toronto [dot] edu
Course Web Site	https://www.cs.toronto.edu/~lczhang/338
Teaching Assistant	Ammous Mustafa

Course Description

Computational methods for solving numerical problems in science, engineering and business. Linear and non-linear equations, approximation, optimization, interpolation, integration and differentiation. The aim is to give students a basic understanding of floating-point arithmetic and the implementation of algorithms used to solve numerical problems, as well as a familiarity with current numerical computing environments. Course concepts are crucial to a wide range of practical applications such as computational finance and portfolio management, graphics and special effects, data mining and machine learning, as well as robotics, bioinformatics, medical imaging and others. [24L, 12T]

Prerequisite: CSC148H5, CSC290H5/MAT202H5;
MAT134H5/MAT136H5/MAT134Y5/MAT135Y5/MAT137Y5/MAT157Y5/MAT233H5, MAT223H5/MAT240H5;
CSC263H5/1.0 MAT credit at the 200+ level.

Exclusion: CSC336H1, CSC350H5, CSC350H1, CSC351H1, CSC337H3 (SCI)

Distribution Requirement: SCI

Students who lack a pre/co-requisite can be removed at any time unless they have received an explicit waiver from the department. The waiver form can be downloaded from [here](#).

Textbooks and Other Materials

Michael Heath, "Scientific Computing: An Introductory Survey," Second Edition, Mc-Graw Hill, 2002.

Assessment and Deadlines

Type	Description	Due Date	Weight
Assignment	Homework	On-going	35%
Term Test	Midterm Test	2020-02-26	20%
Final Exam		TBA	40%
Other	Floating (added to midterm or exam)		5%
Total			100%

More Details for Assessment and Deadlines

There are nine homework assignments in total, due weekly, with each worth an equal amount.

There are two options for the weighting of the midterm and final exam; we choose the one that gives you the highest grade:

1. the midterm is worth 25% and the final exam is worth 40%;
2. the midterm is worth 20% and the final exam is worth 45%.

(This explains the 5% 'floating' grades; it is assigned to whichever of the midterm or final exam is the higher grade.)

Students must earn 40% or above on the exam to pass the course; otherwise, the final course mark will be set no higher than 47%.

Penalties for Lateness

Assignments are to be submitted electronically using MarkUs by 9pm on the due date. Assignments submitted electronically will be timestamped based on the server time, not the student's local/PC time.

There will be a one hour grace period for late assignments. In addition, each student will receive six grace tokens; each grace token can be used for a four-hour extension for an assignment. For example, you may choose to use all six grace tokens on the first assignment, extending its deadline by 24 hours. Or, you may wish to use three tokens for each of two assignments, extending each deadline by 12 hours. MarkUs automatically tracks and deducts grace tokens.

Procedures and Rules

Missed Term Work

Students should immediately contact the instructor via email by no later than the due date if a deadline cannot be met. In the case of medical problems, you are required to have a doctor complete a *UTM medical certificate*, which must say "I saw [student's name] on [date] and it is my medical opinion based on my examination that the student is medically unfit to complete his work at this time. He/she should be able to continue with their studies by [date]." Medical notes saying that the Doctor saw you after you recovered are not adequate and will not be accepted.

Missed Final Exam

Students who cannot write a final examination due to illness or other serious causes must file an [online petition](#) **within 72 hours of the missed examination**. Original supporting documentation must also be submitted to the Office of the Registrar **within 72 hours of the missed exam**. Late petitions will **NOT** be considered. If illness is cited as the reason for a deferred exam request, a U of T Verification of Student Illness or Injury Form must show that you were **examined and diagnosed at the time of illness and on the date of the exam, or by the day after at the latest**. Students must also record their absence on ACORN on the day of the missed exam or by the day after at the latest. Upon approval of a deferred exam request, a non-refundable fee of \$70 is required for each examination approved.

Academic Integrity

Honesty and fairness are fundamental to the University of Toronto's mission. Plagiarism is a form of academic fraud and is treated very seriously. The work that you submit must be your own and cannot contain anyone else's work or ideas without proper attribution. You are expected to read the handout How not to plagiarize (<http://www.writing.utoronto.ca/advice/using-sources/how-not-to-plagiarize>) and to be familiar with the Code of behaviour on academic matters, which is linked from the UTM calendar under the link Codes and policies.

You may *not* discuss the homework with anyone other than your instructors and teaching assistants. The only exceptions are:

- Asking and answering questions on Piazza. Please do not share partial solutions or code on Piazza.
- During office hours, under the supervision of an instructor or teaching assistant.
- During certain tutorials, under the supervision of an instructor or teaching assistant.

Final Exam Information

Duration: 2 hours

Aids Permitted: 1 page(s) of double-sided Letter (8-1/2 x 11) sheet

Additional Information

Here is the tentative schedule for the course. Please note that the course schedule is subject to change, and will be updated on the course website.

Week	Lecture Topic	Tutorial Topic	Deadline
1	Introduction; Errors in Scientific Computing	Software Setup for Homework 1 (Optional)	
2	Floating-Point Numbers	Floating-Point Numbers	Homework 1
3	Systems of Linear Equations; Gauss Elimination	Numpy Tutorial	Homework 2
4	Vector and Matrix Norms; Gauss Elimination With Partial Pivoting	Gauss Elimination	Homework 3
5	Complete Pivoting; Modified Problems; Cholesky Factorization	Cholesky Factorization	Homework 4

6	Linear Least Squares; The Normal Equation	Curve Fitting	Homework 5
7	Midterm; Householder Transform	No tutorials	
8	Nonlinear Equations; Interval Bisection	Midterm Takeup	Homework 6
9	Fixed-Point Iteration; Newton's Method; Secant Method	Fixed-Point Iteration	Homework 7
10	Nonlinear Optimization; Golden Section Search; Newton's Method	Nonlinear Equations	Homework 8
11	Gradient Descent; Newton's Method	Exam Review	Homework 9
12	Principal Component Analysis		

If the university is closed on February 26th, the midterm will be rescheduled for the next lecture on March 4th.

The aid sheet for the final exam must contain no more than 12,000 characters total. If typed, it should use 12-point font or larger.

Last Date to drop course from Academic Record and GPA is March 8, 2020.