Course Pages:

- Quercus: http://q.utoronto.ca
- Google Colaboratory (Course Python Environment): https://colab.research.google.com/ (Students will need to create a free Google account to access Google Colab.)

Course Description:
Scientific computing is a rapidly growing field because computers can solve previously intractable problems and simulate natural processes governed by equations that do not have analytic solutions. During the first part of this course, students will learn numerical algorithms for various standard tasks such as root finding, integration, data fitting, interpolation and visualization. In the second part, students will learn how to model physical systems. At the end of the course, students will be expected to write small programs by themselves. Assignments will regularly include programming exercises.

Main References:
There is no required textbook for the course. Students will be responsible for all material covered in lecture. Some helpful resources may be:

- Numerical Analysis, Burden and Faires (2001)
- An Introduction to Numerical Methods and Analysis, Epperson (2003)

Course Evaluation:

- 8 Assignments - 5% each - 40% Total
- Midterm Exam - 15% - 15% Total
- Final Exam - 45% - 45% Total

Each assignment will relate to the course material, and questions will typically extend examples done in lecture. The midterm and final exam will be of a similar format to the assignments. More details regarding the examinations will be posted to Quercus closer to the examination dates.

Syllabus: The outline below is subject to change.

1. Motivation - Why numerical methods?
2. Introduction to Python programming
3. Approximations and Round-Off Errors
4. Truncation of Errors and Taylor Series
5. Root finding
6. Solving (large) linear systems
7. Numerical optimizations
8. Curve fitting and some machine learning
9. Numerical differentiation and integration
10. Numerical methods for Ordinary Differential Equations (ODEs)
11. Numerical methods for Partial Differential Equations (PDEs)
12. Some advanced topics (time-dependent)

**Academic Integrity:** Throughout this course, it is expected that students will collaborate with one another and/or consult various sources while completing their assignments. This is understood and is to be expected. However, students must complete assignments individually and submit their own work. Any violations will be dealt with by the University very strictly and in accordance with The University of Toronto’s Code of Behaviour on Academic Matters: [https://governingcouncil.utoronto.ca/media/15068/view](https://governingcouncil.utoronto.ca/media/15068/view).

**Accessibility:** The University takes accommodating students with diverse learning styles and needs very seriously. If any accommodations are required, please let the instructor know. Students can also contact UTSC Accessibility services: [ability@utsc.utoronto.ca](mailto:ability@utsc.utoronto.ca).