

Memorial University of Newfoundland  
MATHEMATICS 6210: Numerical Solution of Differential Equations (Fall 2019)  
**Course Outline**

**Classrooms & Times:** ED4010 (TuTh 10:30 - 11:45)

**Instructor:** Dr. Scott MacLachlan, Email: [smaclachlan@mun.ca](mailto:smaclachlan@mun.ca)

**Office hours:** Mondays, from 9:30-11:30 AM, Wednesdays, from 11:00 AM - Noon, and Thursdays from 3-4 PM, in HH 2019. Other times are available by appointment

**Website:** Class information, assignments, and solutions will be available on my home page as PDF files. The URL is [http://www.math.mun.ca/~smaclachlan/math6210\\_F19/](http://www.math.mun.ca/~smaclachlan/math6210_F19/) . This course will not use D2L.

**Textbook:** Relevant links to content will be posted on the course webpage. There are no recommended/required textbooks to purchase.

**Prerequisite:** Permission of the instructor. Comfort and familiarity with undergraduate numerical analysis is expected. This course will include both mathematical proofs and programming (in Python).

**Outline of the Course:**

1. Finite Difference Discretizations (8 classes)
  - Collocation Schemes
  - Elliptic PDEs and boundary conditions
  - Accuracy, Stability, and Consistency
2. Finite Volume Discretizations (2 classes)
3. Spectral Methods (1 class)
4. Fast Poisson Solvers and the FFT (1 class)
5. Finite Element Discretizations (7 classes)
  - Galerkin Methods
  - Approximation Properties
6. Iterative Methods for Solution of Linear Systems (4 classes)
  - Matrix splittings for M-matrices and SPD systems
  - Krylov Methods

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**Evaluation:** 45% Assignments, 20% Midterm, 35% Final Exam

**Assignments:**

- Homework assignments will be announced in class and posted to the course webpage. Assignments are to be turned in during class on the day that they are due. You are allowed one “freebie”, in which you may turn in an assignment during the next class and still receive credit; otherwise, late assignments will not be marked. If you require a longer extension due to exceptional circumstances, please provide me with appropriate documentation and a suggested timeline for completing the work.

**Examinations:**

- One in-class midterm examination will be given, worth a total of 20% of your final mark.
- The final exam is a 2-hour comprehensive test during the formal examination period at the end of the semester. It will cover the entire course and determine 35% of your final mark.

**Missed Exams:**

- If you must miss an exam for an acceptable reason, you are responsible for providing me with appropriate documentation. For foreseeable circumstances, you must notify me in advance of the exam. In any circumstances, you must notify me no later than 48 hours after the exam.
- No makeup midterms will be allowed; in the event of an excused absence for the midterm exam, the grading scheme will be adjusted to 45% for the assignments and 55% for the final exam.
- If you miss the final exam for unacceptable reasons, you will receive a final exam mark of zero. Deferred final examinations will be administered by the department.

**Academic Misconduct:**

- Students are expected to adhere to those principles which constitute proper academic conduct. A student has the responsibility to know which actions, as described under Academic Offences in the University Regulations, could be construed as dishonest or improper. Students found guilty of an academic offence may be subject to a number of penalties commensurate with the offence including reprimand, reduction of grade, probation, suspension or expulsion from the University. For more information regarding this policy, students should refer to the Regulations for Academic Misconduct (Section 4.12) in the School of Graduate Studies Calendar.
- No notes, textbooks, or other aids are permitted during any examination. No electronic devices (including calculators and cell phones) are allowed at your desk or on your person during any examination. Possession of such a device will be considered an academic offense and shall be reported as such.

**Important Dates:**

Wed, Sept 18	Last day to add courses
Oct 14-15	Midterm Break, no classes (October 16/17 are Monday/Tuesday schedule)
Tues, Oct 22	Mixterm Exam
Wed, Oct 30	Last day to drop courses without academic prejudice
Mon, Nov 11	Remembrance Day, no classes (November 15 is Monday schedule)
Fri, Nov 29	Last day of lectures

The midterm exam date is tentative, and will be confirmed in class. In the event of a class cancellation on the date an exam is to be written, check the course website for rescheduling information.

**Accommodations:** Memorial University of Newfoundland is committed to supporting inclusive education based on the principles of equity, accessibility and collaboration. Accommodations are provided within the scope of the University Policies for the Accommodations for Students with Disabilities ([www.mun.ca/policy/site/policy.php?id=239](http://www.mun.ca/policy/site/policy.php?id=239)). Students who may need an academic accommodation are asked to initiate the request with the Glenn Roy Blundon Centre at the earliest opportunity ([www.mun.ca/blundon](http://www.mun.ca/blundon)).