Motivation: Many aspects of our daily lives are effected by GIS and its commercial impact/potential is tremendous. Through recent advances in technology such as vehicle navigation systems, GPS (global positioning systems), wireless/mobile devices, ... GIS is dramatically changing and once again on the forefront of active research and commercial development. This course lays the foundations to understand, use and further GIS technology with particular focus on algorithmic/computational aspects.

Topics include: overview of GIS, GIS data and their representations, operations, multi-resolution models, efficient algorithms for solving key GIS problems such as computing contour lines, visibility queries, distance and geometric shortest path problems, point location, current R&D topics including the use of context in GIS, time&space, High Performance GIS.

Prerequisite: Data Structures and Algorithms (e.g., Computer Science 3804* or equivalent).

Coursework and evaluation:

- 2 Assignments 15% each: total 30%
- Class participation and Class presentation: total 20%
- Project including write-up and demonstration: 25%
- Test: 25%

Some accommodoations are made for undergraduate students attending this course.

Place, time: Tuesdays and Thursdays Time: 8:35 - 9:55 Building: University Centre Room: 279

- Assignments are due before class on the due date. No late assignments can be accepted.
• **Class presentations** are tentatively scheduled for the following days: October 22nd, 24th, and November 5th. The proposals for presentations are due October 8th. The exact dates depend on the number of students.

**Note:** Depending on the number of class participants, class presentations may vary in length.

• **Projects** The projects can be of type: theory or implementation. Topics are selected by you and approved by me. (I am happy to help in the selection process.) The result of any project should be a paper, if possible, of sufficient quality to be publishable in a conference.

**Deadlines** for:

- submitting your topic: October 3rd.
- submitting your project final deadline: December 5th.
- demonstrating your project: December 10th or by special arrangement if this does not work.

Project write-ups (theory or implementation) must contain a survey of related work, a motivation for, and a detailed discussion of the work carried out.

**Implementation Projects:** For implementation projects you would typically implement different data structures or algorithms. Then, their performance is established through rigorous experimental testing. The write-up contains a description of the data structures /algorithms implemented and tested, the tests carried out and the results of the experiments. Should the results show interesting behaviours, they must be explored and discussed.

You will get a chance to demonstrate your projects to me and your class mates in a special demonstration class. We will find a mutually convenient time on December 10th, or around that. Please let me know, as soon as possible, if the 10th would not work for you.

**Theory Projects:** You are encouraged to work on an open problem mentioned in class or stated in the literature. It may happen that you cannot solve the open problem proposed. In this case, you should describe
the approaches attempted and the reasons why they did not work. Marking then focuses on the write-up, including the survey depth, and the strength of the approaches attempted.

- **Test** will be held on the 5th of December. Unless announced otherwise, it will be between 8:30 and 9:55. If you have half an hour longer then we could go until 10:30; please let me know if you DO NOT HAVE TIME during that time slot.

- **Scheduling**
  The project demonstration class on, or around, December 10th replaces the class on Tuesday December 3rd. (So, no class on that day.)

Students with disabilities requiring academic accommodations in this course must register with the Paul Menton Centre for Students with Disabilities for a formal evaluation of disability-related needs. Registered PMC students are required to contact the Centre, 613-520-6608, every term to ensure that I receive your Letter of Accommodation, no later than two weeks before the first assignment is due or the first in-class test/midterm requiring accommodations.