

Course: Experimental Mathematics in Action

Lecturers: Jonathan Borwein and Neil Calkin

First Meeting: Monday January 15th at 10.30 am in D-Drive, FCS.

The last twenty years have been witness to a fundamental shift in the way mathematics is practiced. With the continued advance of computing power and accessibility, the view that "real mathematicians don't compute" no longer has any traction for a newer generation of mathematicians that can really take advantage of computer aided research, especially given the modern computational packages such as Maple, Mathematica, and Matlab.

The goal of this course is to present a coherent variety of accessible examples of modern mathematics where intelligent computing plays a significant role and in doing so to highlight some of the key algorithms and to teach some of the key experimental approaches.

The text book "**Experimental Mathematics in Action**" (AK Peters, 2007) includes the following eight chapters:

1. What is experimental mathematics?
2. Algorithms for experimental mathematics, I
3. Algorithms for experimental mathematics, II
4. Case Study I: Integrals and series using Mathematica
5. Case Study II: Discrete math and number theory in Maple and C++
6. Case Study III: Inverse scattering on Matlab
7. Case Study IV: Analysis and probability using Maple
8. Putting everything together

and one hundred pages of guided exercises. PDF copies will be available for all students.

The course will present chapters 1, 2, 3 and 8 with frequent reference and projects taken from 4, 5, 6, and 7.

PREREQUISITES: While a working knowledge of some mathematical computing package is an advantage, it is certainly not a prerequisite. A prior exposure to third year analysis and algebra will be highly advantageous.

WHEN AND WHERE: Monday, Wednesday and Friday AM (9.30, 10.30 or 11.30 are fine for me). The course will be "hands on" for those who wish to follow along using their laptops, via wireless in D-DRIVE, FCS Second Floor.

ASSESSMENT for undergraduates will be based on four sets of exercises selected from the text valued at 25% of the total grade. Graduates will be assessed with the same four sets of exercises along with a take-home exam/project. Each of those components will be 20% of the total grade.

WEB SITE: <http://www.experimentalmath.info/>