Math 307 Applications of Linear Algebra
2018 Summer Term 1

Course Information:

Class times and location: M 2-3pm in LSK 201/ TuWTh 2-4pm in LSK 201.
Course web page: http://www.math.ubc.ca/~guerrier/m307.html
Pre-requisite: One of MATH 152, MATH 221, MATH 223 and one of MATH 200, MATH 217, MATH 226, MATH 253, MATH 263.

Instructor Information:

Instructor: Claire Guerrier
Email: guerrier@math.ubc.ca
Office: Math Annex 1110
Office Hours: Fri 10-11am, MATX1102 (in Math Annex), or by appointment.

Course Outline:

This course is organized around a collection of interesting applications. Examples from past years are:

> Interpolation
> Finite difference approximations
> Formula matrix of a chemical system
> Least Squares
> Fourier series
> Graphs and Networks
> FFT
> JPEG compression
> Power method
> Recursion relations
> The Anderson tight binding model
> Markov chains
> Google PageRank

We will study a selection of these in this class. Each application will be preceded by discussion of the relevant concepts from Linear Algebra. These will be partly review from your previous linear algebra course and partly new material. You will also learn how to do Linear Algebra on a computer using MATLAB or Octave.
Textbook: There is no required textbook for this course. Instead there is a set of typed notes designed for this course, which is available on the class website.

Computational aspects:

To complete the work for this course, you will need access to MATLAB software. MATLAB is a widely used program for numerical computations with matrices. **As a UBC student, you may obtain a free Student Version here – this version will be sufficient for this course, and I strongly recommend you go with this option.** You can also access MATLAB in the math department computer labs. These are located in LSK 121 and 310. The labs hours are posted here. You may use any free terminal in the labs during these times. You

will need an account to use the terminals – please let me know if you need access. If you prefer, you may also use GNU Octave, which is an open source MATLAB clone that is available for free. It is included in most Linux distributions. Windows and Mac versions are available for free download. However, I will probably only be able to answer questions regarding MATLAB.

Grades:

Homework: There are weekly written homework assignments. Late homework will **not** be accepted. However, your lowest (written) homework score will be dropped (so you can miss one homework if necessary). Nevertheless, even if you miss a deadline, it is a good idea to do the problems, since this is the best way to prepare for the tests and exam. You are welcome to discuss the homework problems with your friends, but you are expected to hand in your own work.
Quizzes: There will be 4 quizzes over the term: May 22, May 29, June 11, and June 18.
Midterm: The midterm will be held during class time in LSK 201 on **Monday, June 4**.
Missing a homework, quiz, or midterm normally results in a mark of 0. Exceptions may be granted in two cases: prior consent of the instructor or a medical emergency. In the latter case, the instructor must be notified within 48 hours of the missed test, and presented with a doctor's note immediately upon the student's return to UBC. Failure to comply results in a 0 mark. If a midterm was missed for legitimate reasons, the weight of the missed midterm will be transferred to the final. Make-up midterms will, in general, not be provided.
The grades will be computed roughly as follows:

> Homework: 10%
> Quizzes: 10%
> Midterm: 30%
> Final exam: 50%

For the midterm and final exam: no calculators, no notes, no books, no cell phones or other electronic devices of any kind.

Resources:

Piazza: You may find Piazza a useful resource for all class-related questions and discussion. Piazza is a question-and-answer platform specifically designed to expedite answers to your questions, using the collective knowledge of your classmates and instructor. It has several features that facilitate discussion of mathematics, most notably support of mathematical typesetting (LaTeX). You are encouraged to answer your classmates' questions, or to brainstorm towards answers, every bit as much as you are encouraged to ask questions.
Math Learning Center: The Math Learning Centre (MLC) is a space for undergraduate students to study math together, with support from math tutors, who are graduate students in the math department. Please note that while students are encouraged to seek help with homework, the MLC is not a place to check answers or receive solutions, rather, its aim is aid students in becoming expert learners; to develop critical thinking and skills in a mathematical setting.