Math 152 - Spring 2021
Linear Systems

A more detailed version of this syllabus is available on the common Canvas website.

Sections and instructors:

201, MWF 1-2, Liming Sun

202, TuTh 8-9:30, Kalle Karu

205, MWF 12-1, Emad Chaparian

206, MWF 12-1, Liming Sun

207, MWF 12-1, Niny Arcila-Maya

208, TuTh 8-9:30, Anirudh Asuri Mukundan

All lectures are via Zoom. Links to Zoom lectures can be found on Canvas.

Corequisite: Math 101.

Overview: Math 152 is a first course in linear algebra. It emphasizes geometry in two and three dimensions, applications to engineering and science problems and practical computations using Matlab. A detailed week by week outline can be found below. Course learning goals are on the Canvas website.

Grade breakdown for the course:

- WebWork 10%
- Matlab assignments 10%
- 2 midterm exams worth 20% each
- final exam 40%

Textbook: We will be using free online lecture notes by Richard Froese and Brian Wetton, specifically written for this course. We will cover all six chapters, excluding the material listed as "additional topics".

Webwork Assignments: Our weekly homework assignments use the online Webwork system. You will need a computer to do these assignments. Webwork assignments will be posted every week on Fridays and they are due on Mondays (after 10 days) at 10PM. There will be twelve assignments. Your lowest mark will be dropped from the average. Webwork can be accessed from Canvas.

Matlab Assignments. We will learn how to use the computer algebra system Matlab to solve linear algebra problems. There will be 6 Matlab assignments that you can download from Canvas. Your solutions are also uploaded on Canvas. The assignments are due on Fridays at midnight, Jan 22, Feb 5, 26, Mar 12, 26, Apr 9. We will have regularly scheduled online Matlab tutorials staffed with TAs.

Matlab material will be tested in exams.

Exams: We will have two 50-minute midterm exams during class hours:

- Feb 24/25 (For MWF and TuTh sections, respectively.)
- March 30/31.

The final exam is scheduled by the university.

Students who miss a midterm exam for a valid reason will have their final mark averaged proportionally over other exams.

Detailed Course Outline:

- week #1 January 11-15: vectors and coordinate representation; vector length, dot product, projection. Notes sections 2.1, 2.2, 2.3.

- week #2 January 18-22: determinants; cross product; lines in 2D, lines and planes in 3D. 2.4, 2.5.

- week #3 January 25-29: geometry of solutions of linear systems; linear dependence and independence; solving linear systems. 2.6, 3.1.

- week #4 February 1-5: echelon form, reduced echelon form, rank; homogeneous equations. 3.2, 3.3.

- week #5 February 8-12: geometric applications; resistor networks. 3.4, 3.5.

- Spring Break: February 15-19.

- week #6 February 22-26: Exam #1, matrix multiplication; linear transformations. 4.1, 4.2.

- week #7 March 1-5: rotations, projections and reflections in 2D; matrix representation and composition of linear transformations. 4.2, 4.3.

- week #8 March 8-12: random walks, matrix transpose; matrix inverse, determinants; 4.3, 4.4, 4.5, 4.6.

- week #9 March 15-19: complex numbers; complex exponential and polar form. 5.1, 5.2, 5.3, 5.4.

- week #10 March 22-26: eigenvalues and eigenvectors 6.1.

- week #11 March 29- April 2: Exam #2 powers of a matrix; application of eigen-analysis to random walks. 6.2.

- week #12 April 5-9: vector differential equations; LCR circuits. 6.3, 6.4.

- week #13 April 12-14: complete course material; review.

University policies:

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available on the UBC Senate website `https://senate.ubc.ca/policies-resources-support-student-success`.