

# Math 152 - Spring 2020

## Linear Systems

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

### **Time, location and instructor for each section:**

- 201, MWF 1-2, MATH 100 (Kalle Karu)
- 202, TuTh 8-9:30, MATH 100 (Alexander Weekes)
- 205, MWF 12-1, SWNG 122 (Dylan Allegretti)
- 206, MWF 12-1, MATH 100 (Yue-Xian Li)
- 207, MWF 12-1, MATX 1100 (Najmul Abid)
- 208, TuTh 8-9:30, LSK 201 (Ming Zhang)

**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%
- 3 midterm exams worth 10% each
- final exam 50%

**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 17, 31, Feb 14, 28, Mar 13, 27.

We will have regularly scheduled Matlab tutorials staffed with TAs. You can go to any of these tutorials. The tutorial room LSK 121 does not have computers, so bring your own.

Matlab material will be tested in exams.

**Exams:** We will have three 35-minute midterm exams during class hours:

- Jan 29/30 (For MWF and TuTh sections, respectively.)
- February 26/27.
- March 18/17.

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 the other course material.

No calculators or notes in any exam.

**Where to get help:**

- Go to office hours. The times and locations for each section will be posted on Canvas.
- Matlab tutorials will be held regularly in LSK 121.
- The Math Learning Centre (MLC) is open every weekday 12-5 in LSK 301. It is staffed by TAs who can help with course material, homework, Matlab.
- We will have a Piazza page set up for the course.

**Detailed Course Outline:**

- Week #1, January 6-10: vectors and coordinate representation; vector length, dot product, projection. Notes sections 2.1, 2.2, 2.3.
- Week #2, January 13-17: determinants; cross product; lines in 2D, lines and planes in 3D. 2.4, 2.5.
- Week #3, January 20-24: geometry of solutions of linear systems; linear dependence and independence; solving linear systems, echelon form. 2.6, 3.1.
- Week #4, January 27-31: Exam #1; reduced row echelon form, rank; homogeneous equations. 3.2, 3.3.
- Week #5, February 3-7: geometric applications; resistor networks. 3.4, 3.5.
- Week #6, February 10-14: matrix multiplication; linear transformations; rotations, projections and reflections in 2D; matrix representation and composition of linear transformations. 4.1, 4.2.

- Spring Break: February 17-21.
- Week #7, February 24-28: Exam #2, random walks. 4.3.
- Week #8, March 2-6: transpose; matrix inverse, determinants; complex numbers; complex exponential and polar form. 4.4, 4.5, 4.6, 5.1, 5.2, 5.3, 5.4.
- Week #9, March 9-13: eigenvalues and eigenvectors 6.1.
- Week #10, March 16-20: Exam #3, powers of a matrix; application of eigen-analysis to random walks. 6.2.
- Week #12, March 23-27: vector differential equations; LCR circuits. 6.3, 6.4.
- Week #13, March 30-April 1: 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>.