

# Math 152 - Spring 2024

## Linear Systems

**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%.
- Two midterm exams worth 15% 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.** There will be 11 Webwork assignments. They are due on Fridays at 10 PM. The lowest Webwork score will be dropped from the final grade.

**Matlab Assignments.** There will be 6 Matlab assignments. They are due on every second Monday at 10 PM. Matlab assignments are downloaded from Canvas, and solutions are also uploaded to Canvas. All 6 assignments will count towards final grade.

**Labs.** We will have regularly scheduled Matlab tutorials that run on Zoom. The tutorials run during the week before the Matlab assignment due date. Matlab material will be tested in exams.

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

- February 13/14.
- March 20/21.

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 exams. Calculators and notes are not permitted in any exam.

### Detailed Course Outline:

- Week #1: vectors and coordinate representation; vector length, dot product, projection. Notes sections 2.1, 2.2, 2.3.
- Week #2: determinants; cross product; lines in 2D, lines and planes in 3D. 2.4, 2.5.
- Week #3: geometry of solutions of linear systems; linear dependence and independence; solving linear systems, echelon form. 2.6, 3.1.
- Week #4: reduced row echelon form, rank; homogeneous equations. 3.2, 3.3.
- Week #5: geometric applications; resistor networks. 3.4, 3.5.
- Week #6: Exam #1, matrix multiplication; linear transformations. 4.1, 4.2.
- Spring Break.
- Week #7: rotations, projections and reflections in 2D; matrix representation and composition of linear transformations. 4.2, 4.3.
- Week #8: random walks; transpose; matrix inverse, determinants. 4.4, 4.5, 4.6.
- Week #9: complex numbers; complex exponential and polar form. 5.1, 5.2, 5.3, 5.4.
- Week #10: Exam #2, eigenvalues and eigenvectors 6.1.
- Week #11: powers of a matrix; application of eigen-analysis to random walks. 6.2.
- Week #12: vector differential equations; LCR circuits. 6.3, 6.4.
- Week #13: 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>.