

MATH 221: MATRIX ALGEBRA, SECTION 104, 2018

1. CONTACT INFORMATION

The instructor for this course is me, Samuel Bach. I may be reached at samuelbach@math.ubc.ca. All email should receive a reply within 24 hours. The website for the course is <https://canvas.ubc.ca/courses/5944/>.

My personal website is <http://www.math.ubc.ca/~samuelbach/>.

2. MEETING TIMES

The course meets at the following times:

- Monday, 1-2,
- Wednesday, 1-2,
- Friday, 1-2

All lectures take place in the Leonard S. Klinck building (LSK) room 201.

The first lecture is on Wednesday, 5th September. There will be no lecture on

- Monday, 8th October (Thanksgiving);
- Monday, 12th November (Remembrance Day).

The last lecture will be on Friday, 30th November.

3. OFFICE HOURS

You may prefer to attend the office hours of your own instructor, but all office hours are available to all students.

Office hours will be set after term begins, and will be clearly listed on the course website. My own office hours will also be on my own website.

4. DESCRIPTION

Math 221: Matrix Algebra is an introductory course in linear algebra.

Linear algebra is a fundamental and extremely important topic in mathematics. Many other branches of mathematics are concerned with reducing more complicated questions to problems in linear algebra. For instance, calculus tries to reduce questions about curves and surfaces (or higher dimensional shapes) to ones about their tangent lines or tangent planes. These lines and planes are concepts in linear algebra.

This course is a study of linear maps. We will learn what they are, how to manipulate them as well as tools (determinants, eigenvectors/eigenvalues, diagonalization) to visualize them better. Along the way we will also touch on various applications.

5. HOMEWORK AND CONTINUOUS ASSESSMENT

WebWork. Homework assignments in this course will mostly take the form of automated WebWork assignments. These will be worth at least a total of 12% of the course grade. They will be posted online each week, and will be due on the Thursday of the following week. Please note the following items:

You may attempt each question as often as you like until you solve the problem. There is no penalty for a wrong answer. This is to help you correct your own mistakes, and to get instant feedback on your attempts.

The questions are generated randomly, and the numbers are different for each student.

Please try to do the problems by yourself, and without the use of other calculators or software, unless otherwise instructed. Since calculators and software are not allowed in the exams, you should practice working without them.

If you really get stuck, you can request help by clicking the email instructor button. It may take some time to get a response, so please don't wait till the last minute.

In general, it's a good idea to start the assignments early rather than waiting till the last minute. The deadlines are enforced by the system, and it will shut down automatically when time is up, so give yourself plenty of extra time in case of difficulties.

MATLAB. There will be a small number of short MATLAB assignments, no more than 5. They will also be due on Thursdays, and will be worth no more than 4% of the course grade.

Clickers. We will incorporate interactive answering of questions into lecture using clickers. These will be worth a small amount of the final grade, 4%, all of which is for participation.

6. EXAMS

There will be two midterm exams and a final exam in this course.

- The first midterm will be in class on Wednesday 10th October (Thursday 11th October for section 101);
- The second midterm will be in class on Wednesday 7th November (Tuesday 6th November for section 101);
- The final exam time will be announced by UBC later in the term.

Both midterms will cover material covered in lecture up to the last lecture of the previous week.

7. FINAL GRADE CALCULATION

Your final grade will be calculated as whichever is better for you of the two options

- 20% from the homework and class participation (clickers), (15+15)% from the two midterms, 50% from the final exam;
- 20% from the homework and class participation (clickers), 15% from one of the midterms, 65% from the final exam.

We will adjust all midterm scores or all final exam scores so that the median score on each is 66%. If you must miss a midterm, you will be graded according to the second formula above. No make-up midterms will be given.

8. TEXTBOOK

The textbook for this course is Linear algebra and its applications by David Lay. The third edition (customised for UBC) is the specific edition the department issues to instructors, although if you have another edition, that should be fine. In particular, the custom UBC edition is a subset of *Linear algebra and Its Applications, 4th edition*. Secondhand copies of this book can be easily obtained and are not expensive.

9. TOPICS TO BE COVERED

More detailed Learning Goals will be available later on this website. Here is a list of the topics to be covered on a weekly basis. The references are to the third (UBC) edition of the book.

Week	Chapter	Titles	Notes
1	1.1,1.2	Systems of Linear Equations, Row Reduction and Echelon Forms	First Midterm
2	1.2,1.3,1.4	Row Reduction Echelon Forms, Vector Equations, Matrix Eq. $A\mathbf{x} = \mathbf{b}$	
3	1.5,1.6,1.7	Solution Sets, Applications, Linear Independence	
4	1.8,1.9	Introduction to Linear Transformations, the Matrix of a Linear Transformation	
5	2.1,2.2	Matrix Operations, the Inverse of a Matrix	
6	2.2,2.3	The Inverse of a Matrix (cont), Characterizations of Invertible Matrices	
7	2.5,2.6	Subspaces of $\mathbf{R}^n$, Dimension and Rank	Second Midterm
8	2.6,3.1,3.2	Dimension and Rank (cont), Determinants & their properties	
9	4.1,4.2	Eigenvectors & E'values, Characteristic Equation	
10	4.3,4.4,4.6	Diagonalization, E'vectors & Linear Transf., Discrete Dynamical Systems	
11	5.1,5.2	Inner Product, Length, Orthogonality, Orthogonal Sets	
12	5.3,5.5	Orthogonal Projections, Least-Squares Problems	
13	5.6, Review	Applications to Linear Models	

TABLE 1. Weekly outline of topics

10. WHERE TO LOOK FOR HELP, AND OTHER ADVICE

For problems of a non-personal nature, please use the Piazza software (there is a link to this from the Canvas website). This is the best way to have a question answered quickly.

For problems with the material or homework, the UBC Math Learning Centre will also be happy to help you. They offer a drop-in service starting from the second week of term: <https://www.math.ubc.ca/~MLC/>

You can also attend the office hours of your instructor or of any other instructor for Math 221. These hours are listed at the top of this page.

For enrolment problems, talk to the math office.

For all other problems, contact me.