

MAT 211 - Introduction to Linear Algebra

Welcome to Mat 211! The aim of the course is to develop the basic tools of linear algebra and some applications.

Click on the top for more information:

The [Info](#) section contains times and locations of the lectures, information about the textbook, etc.

You will find information about office hours and ways to contact your instructors in the [Instructors](#) section.

The week-by-week progress of the lectures and the weekly homework assignments are posted in the [Schedule & Homework](#) section.

Information about the exams is contained in the [Exams](#) section.

Info

Times and places:

MW 2.30-3.50pm Earth&Space 069

Important dates are on the university [Spring 2017 academic calendar](#).

Textbook:

Linear Algebra with Applications, by Otto Bretscher (5th edition), Pearson.

NB: You can also use older editions (4th or 3rd edition) of the textbook if you wish. However, make sure to compare frequently the book you are using with the 5th edition for changes in the materials covered and the exercises!

Prerequisite:

C or higher in AMS 151 or MAT 131 or 141 or coregistration in MAT 126 or level 7 on the mathematics placement examination.

Main topics covered:

The main topics we will cover during the semester are: systems of linear equations, vectors and matrices, linear independence, inner products and orthonormal bases, determinants, eigenvalues and eigenvectors.

Lectures and office hours:

You are expected to attend lectures every week. Lectures give some basic understanding of the topics covered in the course. To do well in the course you should complement the lectures with independent study. There are no recitations scheduled for this course, so it is particularly important that you spend time on your own (or in groups!) working on many problems.

Because there are no recitations for the course, it is also essential that you ask many questions during and outside the lectures. I will hold office hours every week and so will do the grader for the course. The times and locations of our office hours are on the [Instructors](#) page, as well as our contact details.

Homework:

Homework will be assigned weekly in the [Schedule & Homework](#) section and is due at the first lecture the following week. No late homework will be accepted. There will be about 10/15 problems each week and five of these will be graded.

Grading policy:

There will be two midterm exams each worth 20% of the final grade, a final exam (40%) and weekly homework (20%). Check the [Exams](#) page for the dates of the exams and make sure to be available at those times.

If you need math help:

I am happy to help! Come to my office hours with questions on homework and lectures. Additional help is available at the [Math Learning Center](#).

DSS advisory:

If you have a physical, psychiatric, medical, or learning disability that could adversely affect your ability to carry out assigned course work, we urge you to contact the Disabled Student Services office (DSS), Educational Communications Center (ECC) Building, room 128, (631) 632-6748. DSS will review your situation and determine, with you, what accommodations are necessary and appropriate. All information and documentation regarding disabilities will be treated as strictly confidential. Students for whom special evacuation procedures might be necessary in the event of an emergency are encouraged to discuss their needs with both the instructor and with DSS. Important information regarding these issues can also be found at the following web site: <http://ws.cc.stonybrook.edu/ehs/fire/disabilities.shtml>

Academic Integrity:

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology and Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at:

<http://www.stonybrook.edu/uaa/academicjudiciary>

Instructors

Lorenzo Foscolo

Room 2-121, Math Tower

E-mail: lorenzo.foscolo@stonybrook.edu

Office hours:

M 4-5pm in Math Tower 2-121

Tue 1.30-2.30pm in MLC

Tue 2.30-3.30pm in Math Tower 2-121

Jae Ho Cho (grader)

Room S-240A, Math Tower

E-mail: jaeho.cho@stonybrook.edu

Office hours:

M 11am -12pm in MLC

Schedule & Homework

Week 1, Jan 23-29

Reading: 1.1, 1.2, 1.3

Week 2, Jan 30-Feb 5

Reading: 1.3, 2.1, 2.2

Homework: 12, 14, 20, 30, 36 in §1.1

4, 32, 44 in §1.2

4, 24, 36, 46, 48 in §1.3

HW1 is due on Mon Feb 6.

Week 3, Feb 6-12

Reading: 2.2, 2.3, 2.4

Homework: 6, 20, 22, 32, 43, 54, 56 in §2.1 (you should ignore the part about inverse in problems 20 and 22)

2, 6, 12, 20, 26 in §2.2

2, 8, 14 in §2.3

HW2 is due on Mon Feb 13.

Week 4, Feb 13-19

Reading: 2.4, 3.1

Homework: 34, 50, 60 in §2.3

2, 8, 32, 34, 38 in §2.4

4, 8, 12, 22 in §3.1

HW3 is due on Mon Feb 20.

Week 5, Feb 20-26

Review and First Midterm Exam

Week 6, Feb 27 - March 5

Reading: 3.2, 3.3

Homework: 2, 12, 14, 26, 30 in §3.2

6, 22, 26, 28, 30, 32, 38 in §3.3

HW4 is due on Wed Mar 8.

Week 7, March 5-12

Reading: 3.4, 4.1

Homework: 4, 6, 14, 18, 20, 22, 28, 40, 42 in §3.4

8, 16, 20, 22, 28, 32 in §4.1

HW5 is due on Wed Mar 22.

Week 8, March 20-26

Reading: 4.1, 4.2, 4.3

Homework: 4, 6, 22, 26, 52, 54 in §4.2

6, 22, 24, 26, 44, 54, 56, 64 in §4.3

HW6 is due on Wed Mar 29.

Week 9, March 27 - Apr 2

Review and Second Midterm Exam

Week 10, Apr 3-9

Reading: 5.1 (you should skip pp. 212-214) and 5.2

Homework: 6, 10, 16, 21, 26, 27, 28 in §5.1

6, 7, 14, 20, 21, 29, 33, 34 in §5.2

HW7 is due on Wed Apr 12.

Week 11, Apr 10-16

Reading: 5.3, 6.1 (only pp. 265-268)

Homework: 4, 10, 20, 24, 26, 34, 36, 46, 52 in §5.3

8, 10, 16, 18 in §6.1

HW8 is due on Wed Apr 19.

Week 12, Apr 17-23

Reading: 6.2, 6.3

Homework: 5, 6, 8 in §6.2 (using Laplace expansion for the determinant instead of Gauss-Jordan)

17, 20 in §6.2 (use the standard bases for the space of polynomials of degree at most 2 and the space of 2×2 matrices)

38, 46 in §6.2 (Hint for 46: expand the determinants with respect to the second column)

2, 7, 22, 24, 30, 31 in §6.3

HW9 is due on Wed Apr 26.

Week 13, Apr 24-30

Reading: 7.1 (only up to and including p. 315), 7.2, 7.3 and the box at the end of p. 351

Homework: 16, 18, 60 in §7.1

4, 6, 8, 10, 38 in §7.2

4, 6, 8, 12, 18, 45 in §7.3

4 in §7.4

HW10 is due on Wed May 3.

Week 14, May 1-7

Review.

Exams

Midterm I: Wednesday Feb 22, 2.30-3.50pm, Earth&Space 069

Midterm I will cover Chapters 1 and 2 and Section 3.1 in the textbook. You should be able to:

- 1) solve linear systems,
- 2) find the reduced row echelon form of a matrix,
- 3) determine the rank of a matrix,
- 4) determine when a transformation is linear,
- 5) write the matrix of a linear transformation,
- 6) calculate the product of two matrices,
- 7) find the inverse of a matrix,
- 8) determine the image and kernel of a linear transformation.

To prepare well for the exam review your notes, textbook and homework. You should also go through the following review exercises at the end of each chapter:

Chapter 1: 1-3, 5-9, 11-14, 16-20, 23, 34

Chapter 2: 3-13, 16-18, 20-25, 27, 30

Midterm II: Wednesday March 29, 2.30-3.50pm, Earth&Space 069

The exam will cover the materials of Chapters 3 and 4 in the textbook. You should be able to:

- Find a basis for the image and kernel of a matrix (§3.2-3.3)
- Calculate the dimension of a subspace of \mathbb{R}^n and the rank and nullity of a matrix (§3.2-3.3)
- Find a basis of \mathbb{R}^n "adapted" to a linear transformation, that is, a basis such that the matrix that represents the linear transformation is as simple as possible (§3.4)
- Verify that a set is a vector space, find a basis and calculate its dimension (§4.1)
- Calculate kernel and image of a linear transformation between vector spaces (§4.2)
- Given bases, calculate the matrix that represents a linear transformation between vector spaces (§4.3)

Final exam: Wednesday May 10, 8-10.45am, Old Engineering 143

The exam will cover all that we have done during the semester, with an emphasis on the last part of the course. Look at the Schedule & Homework section to see which sections in the textbook we have covered and which sections you can skip.

Things you should be familiar with to do well on the exam:

- solve a linear system using the Gauss-Jordan elimination process

- establish when vectors are linearly independent and when a vector is a linear combination of others
- calculate rank and nullity of a matrix and find bases for its image and kernel
- understand linear transformations defined using geometry (projections, reflections, rotations)
- calculate kernel and image of a linear transformation between vector spaces
- calculate the matrix of a linear transformation between vector spaces with respect to a given basis
- apply the Gram-Schmidt process to find orthonormal bases
- use orthonormal bases to calculate projections onto subspaces
- manipulate algebraically the operation of transpose and inverse of a matrix
- calculate the determinant of a square matrix to decide whether the matrix is invertible
- solve a linear system using Cramer's Rule
- find eigenvalues and eigenvectors and diagonalize a matrix

To prepare for the exam review past homework assignments, your notes, the textbook and do plenty of exercises (there are lots of them in the textbook!). Here's a possible short selection of exercises to review all that we have done during the semester:

- 5 or 7 in §1.2
- 11 in §2.2
- 9 or 11 in §3.3
- one of 7, 9, 13, 15 in §3.4
- 25 or 27 in §3.4
- 51 or 53 in § 4.2
- 7 or 9 in § 4.3
- 21 or 23 in §4.3
- 27 in §5.1
- 7 or 13 in §5.2
- one of 5, 7, 21, 23 in §5.3
- 15 or 17 in §6.1
- 23 in §6.3
- one of 15, 17, 19 in §7.1
- one of 3, 5, 7, 11 in §7.3
- 45 in §7.3

I will hold office hours as follows:

Monday May 8, 4-5pm, Math Tower 2-121

Tuesday May 9, 11am-1pm, Math Tower 2-121
1.30-2.30pm in MLC

If you need help outside of these times, write me an email and we will arrange a time to meet.

Exam Rules:

Calculators are not needed and therefore not allowed.

All electronic devices (except watches) must be turned off. In particular, cellphones are not allowed. If you take your cellphone out for any reason (even just to check the time), you will be asked to turn in your exam paper and to leave the room.

Notes, textbooks, etc. are not allowed. Only the test paper and pens/pencil/eraser should be on your desk.

No consultations with others. Please raise your hand if you have any question.

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