Fall 2021 GA 2110 Linear Algebra I Syllabus

Contact Information

Instructor: Weilin Li  
Email: weilinli@cims.nyu.edu  
Office hours time: Wednesday 4 pm – 6 pm  
Office hours location: Courant Institute, Warren Weaver Hall, Room 604

Meeting Times

Lecture time: Tuesday, 5:10 – 7:00 pm  
Lecture location: Courant Institute, Warren Weaver Hall, Room 1302  
No lecture on Tuesday, October 12 due to Legislative day

Textbooks


Prerequisites

Undergraduate linear algebra ([Math 140 at NYU](#)) is strongly recommended. Motivated and mathematically experienced students who have not taken a first course in linear algebra can still enroll.

Goals and Content

This is an advanced linear algebra course. In a nutshell, we will cover the same topics as a first semester undergraduate course, but with superior sophistication, greater generality, and more rigor. The primary focus is on the *theory* of finite dimensional vectors spaces, linear transformations, matrices, and connections to geometry. This is not a computational course (which is usually covered in a numerical linear algebra class).

Communication and Software

- Lecture will be held in person unless otherwise mandated by the university. All students are expected to come to class. Lectures will **not** be recorded.  
- Lecture notes, written homework assignments, solutions, and important announcements will be posted on **NYU Brightspace**.  
- Homework will be submitted and graded electronically via **Gradescope**.
• If you have math questions, it is best to speak in person either during office hours or immediately after lecture. You do not need to set up an appointment to come to office hours – just drop by.
• If you need to contact me outside of lecture and office hours, it is best to email me. Please do not send me messages through NYU Brightspace.

Tentative Calendar

Tentative schedule following the primary textbook:

<table>
<thead>
<tr>
<th>Lecture #</th>
<th>Chapters</th>
<th>Topics</th>
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<tbody>
<tr>
<td>1</td>
<td>1.1–1.3</td>
<td>Vector spaces and subspaces</td>
</tr>
<tr>
<td>2</td>
<td>1.4–1.6</td>
<td>Linear combinations and (in)dependence</td>
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<tr>
<td>3</td>
<td>2.1–2.3</td>
<td>Linear transformations and matrices</td>
</tr>
<tr>
<td>4</td>
<td>2.3–2.6</td>
<td>Properties of linear transformations</td>
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<tr>
<td>5</td>
<td>3.1–3.2</td>
<td>Inverse of a matrix</td>
</tr>
<tr>
<td>6</td>
<td>3.3–3.4</td>
<td>Solving systems of equations</td>
</tr>
<tr>
<td>7</td>
<td>4.1–4.2</td>
<td>Calculating the determinant</td>
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<tr>
<td>8</td>
<td></td>
<td>Exam 1</td>
</tr>
<tr>
<td>9</td>
<td>4.3–4.4</td>
<td>Properties of the determinant</td>
</tr>
<tr>
<td>10</td>
<td>5.1–5.2</td>
<td>Eigenvalues and eigenvectors</td>
</tr>
<tr>
<td>11</td>
<td>5.2, 5.4</td>
<td>Diagonalization of matrices</td>
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<tr>
<td>12</td>
<td>6.1–6.3</td>
<td>Inner products, norm, orthogonality</td>
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<tr>
<td>13</td>
<td>6.3–6.4</td>
<td>Adjoints, projections, spectral theory</td>
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<tr>
<td>14</td>
<td>7.1–7.2</td>
<td>Jordan canonical form</td>
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<td></td>
<td>Exam 2</td>
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• Exam 1 will be held during lecture on November 2.
  It will include material from Chapters 1–3 that were covered in lecture.
• Exam 2 will be held during the final exam time slot assigned by the university (TBA).
  It will include material from Chapters 4–7 that were covered in lecture.

Course Components and Grading

Written Homework (60%)

Written homework will be assigned weekly, except during certain weeks. Each one will be due at 5 pm on Friday and should be submitted electronically via Gradescope. No late homework is accepted, except for qualifying emergencies (refer to the sick and late policy below). Submit your best of work even if you are not able to fully solve a problem, as partial credit will be rewarded.

While collaboration is highly encouraged, each student is responsible for writing up his/her solutions individually. Direct copying of another student’s homework, even if all students contributed, is considered a violation of academic integrity.
Exams (40%) 
There will be two timed exams that will count for 20% each. During exams, students are allowed to consult the two textbooks used for this course (no other books are allowed), any materials provided by the instructor (e.g., homework solutions, lecture notes), and personal notes (including submitted homework). The exams are to be completed individually. Internet searching and laptop/phone use are prohibited. Any cheating will result in a zero and will be reported to the math department and office of academic integrity.

Sick and Late Policy
Late homework and exams are not accepted, except for any of the following reasons.

- Religious holiday: contact me at least one week prior to the deadline to discuss make-up options.
- Qualified academic activity: have your coach or faculty member send me an email entailing the academic activity at least one week in advance.
- Family emergency or sickness: contact me ASAP to discuss make-up options. Any students who contract COVID are not required to disclose.

In general, late homework must be made-up within three days of the original due date, so that solutions can be posted online in a timely manner. If the qualifying reason prevents you from completing the assignment within three days, other alternatives will be discussed.

Accommodations
If you have an academic disability or condition that requires accommodation, please let me know ASAP and register with the Moses Center.

Academic Integrity

Academic integrity rules are strictly followed and enforced.

Advice

- Attend lectures, actively participate (e.g., take notes, ask questions), and come prepared (e.g., read the textbook beforehand, review notes from the previous lecture).
- Carefully read homework solutions, lecture notes, etc. Mathematics is a technical subject – a small detail can be the difference between a fully correct solution and a completely wrong one.
- There is only one grader for many students. Do not expect the grader to catch all of your mistakes or to give you detailed feedback. It is your responsibility to compare your answers with the upload solutions.
Think deeply and critically. Is the statement true or false if one of the assumptions is modified or relaxed? What are the main ideas behind the proof of a main theorem and can they be applied to a different problem? How are the homework problems connected to lecture and why is a problem interesting or not?