

## MATH 350.02 - LINEAR ALGEBRA SYLLABUS

**Instructor:** Dennis Kriventsov

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**Office Hours:** WTh 17:00-18:00 (subject to change)

**Lecture:** TF 17:00-18:20, in SEC-216

### Textbook

The recommended textbook is *Linear Algebra* by Stephen H. Friedberg, Arnold J. Insel, and Lawrence E. Spence (Pearson, 4th edition). You do not, strictly speaking, require it, but not having access to it will make the course dramatically, needlessly, harder. Older editions should be generally adequate, but may cause some confusion about section numbering. While I will frequently assign problems from the text, I will post full statements of the problems online.

### Prerequisites

The official prerequisites for this class are Introduction to Linear Algebra 250 AND Math 300 with a grade of C or better AND (Math 244 OR 252 OR 292). This class is largely independent of Math 250. Material from Math 300 may occasionally be used, often with brief review, but much more importantly the familiarity with writing proofs developed in that class will be absolutely essential to success in this one. Material from the differential equations prerequisite will generally not be seen in class directly, but may help give a base set of examples to relate to.

### Enrollment

If you are not enrolled in the class, and are unable to enroll now due to the section being marked as closed, you must use the web-based special permission system to attempt to enroll. I cannot intervene directly to enroll you.

### Objectives

The main purposes of the class are to (1) develop the traditional subject matter of linear algebra in a rigorous, mostly self-contained way, (2) show how this material provides a foundational language for higher mathematics, and (3) to refine proof-reading and proof-writing skills and formal, mathematical thinking. Linear algebra appears often both in mathematics and the world at large, typically in one of two forms: in some areas it serves as an archetype of algebraic structures, a point of comparison, contrast, or analogy for development of more complicated subjects, while in others it shows up as a devastatingly effective tool to attack other problems with. In the latter case, a reduction to or reformulation

as linear algebra is oftentimes among the most powerful techniques for approaching difficult questions. However, (3) should not be underestimated; interest of the material aside, a core aim of the class is to develop fundamental mathematical skills, and we will emphasize formal thinking and communicating mathematics as much as the material itself.

## Schedule

The schedule below is provisional, and subject to change.

| Dates       | Chapter     | Topic(s)  |
|-------------|-------------|---|
| 9/4-9/7     | Chapter 1   | Abstract vector spaces, subspaces, spans.         |
| 9/11-9/14   | Chapter 1   | Linear independence, bases.                       |
| 9/18-9/21   | Chapter 1,2 | Bases, dimension, linear transformations.         |
| 9/25-9/28   | Chapter 2   | Matrices, invertibility, isomorphisms.            |
| 10/2-10/5   | Chapter 2   | Change of coordinates, dual spaces.               |
| 10/9-10/12  | Chapter 3   | <b>Midterm 1</b> , elementary operations, rank.   |
| 10/16-10/19 | Chapter 3,4 | Systems of equations, determinants.               |
| 10/23-10/26 | Chapter 4,5 | Determinants, eigenvalues.                        |
| 10/30-11/2  | Chapter 5   | Diagonalization, limits.                          |
| 11/6-11/9   | Chapter 5,7 | Invariant subspaces, Jordan form.                 |
| 11/13-11/16 | Chapter 7   | Jordan form, <b>Midterm 2</b> .                   |
| 11/21       | Chapter 7   | Minimal polynomial ( <b>note weird schedule</b> ) |
| 11/27-11/30 | Chapter 6   | Inner product spaces                              |
| 12/4-12/7   | Chapter 6   | Orthogonal operators                              |
| 12/11       | Chapter 6   | Orthogonal operators.                             |
| 12/19       |             | <b>Final Exam: 12:00</b>                          |

## Class Structure

There will be weekly homework assignments (usually due Friday in class). If you are unable to turn in the homework in lecture, you may email it to me *before* class; this may mean that you will not receive feedback from the grader on that assignment. Late homework will not be accepted for any reason. Collaborating on homework is acceptable, but the work you turn in must be your own. Homework will contribute to 15% of the grade.

There will be two midterm exams, in class, on **October 9** and **November 16**. No books, phones, or notes will be permitted; see the exam policy below. No makeup midterm exams will be offered. They will make up 25% of the grade each.

The remaining 35% of the grade will come from the final exam, which will take place on **Wednesday, December 19, 12:00 to 15:00**. This time cannot be changed.

## Exams

Make-up midterms will not be given under any circumstances. In case of extenuating circumstances (religious holiday, medical emergency), an arrangement may be made to extrapolate the missing midterm grade from other exam scores, at instructor discretion and in accordance with relevant Rutgers regulations. Unless the reason the exam was missed was genuinely an emergency, no such arrangement will be made after the exam time; it must be made

beforehand. The policy for final exams is similar, but there are some exceptional circumstances under which a makeup exam may be offered at a university-specified makeup time. Make sure to consult me *at least a week before* the final exam date if you think you require a makeup final exam.

Using a phone, book, notes, or classmate's work during an exam will likely result in a failing grade in the class (as well as further disciplinary action by the university). More generally, all students in the course are expected to be familiar with and abide by the academic integrity policy <http://academicintegrity.rutgers.edu/academic-integrity-policy/>. Violations of the policy are taken very seriously.

## Student Wellness Services

**Counseling, ADAP & Psychiatric Services (CAPS)** (848) 932-7884 / 17 Senior Street, New Brunswick, NJ 08901 / [www.rhscaps.rutgers.edu/medical-counseling-services/counseling](http://www.rhscaps.rutgers.edu/medical-counseling-services/counseling)

CAPS is a University mental health support service that includes counseling, alcohol and other drug assistance, and psychiatric services staffed by a team of professional within Rutgers Health services to support students efforts to succeed at Rutgers University. CAPS offers a variety of services that include: individual therapy, group therapy and workshops, crisis intervention, referral to specialists in the community and consultation and collaboration with campus partners.

**Violence Prevention & Victim Assistance (VPVA)** (848) 932-1181 / 3 Bartlett Street, New Brunswick, NJ 08901 / [www.vpva.rutgers.edu/](http://www.vpva.rutgers.edu/)

The Office for Violence Prevention and Victim Assistance provides confidential crisis intervention, counseling and advocacy for victims of sexual and relationship violence and stalking to students, staff and faculty. To reach staff during office hours when the university is open or to reach an advocate after hours, call 848-932-1181.

**Disability Services** (848) 445-6800 / Lucy Stone Hall, Suite A145, Livingston Campus, 54 Joyce Kilmer Avenue, Piscataway, NJ 08854 / <https://ods.rutgers.edu/>

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: <https://ods.rutgers.edu/students/documentation-guidelines>. If the documentation supports your request for reasonable accommodations, your campus disability services office will provide you with a Letter of Accommodations. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. To begin this process, please complete the Registration form on the ODS web site at: <https://ods.rutgers.edu/students/registration-form>.

**Scarlet Listeners** (732) 247-5555 / <http://www.scarletlisteners.com/>

Free and confidential peer counseling and referral hotline, providing a comforting and supportive safe space.