Linear Algebra (MAT 310-01)

Fall 2024

Lecturer: Paula Burkhardt-Guim	**Time:** MW 9:30 – 10:50 AM
TAs: Filip Samuelsen and Austin Konkel	**Place:** Javits 111

Course Pages:

1. Brightspace: https://mycourses.stonybrook.edu/d2l/home/1420027

2. Textbook PDF (free!): https://link.springer.com/content/pdf/10.1007/978-3-031-41026-0.pdf

Email addresses and office hours:
Burkhardt-Guim: paula.burkhardt-guim@stonybrook.edu, W 11:00 AM – 1:00 PM in Math Tower 3-119, M 11:00 AM - 12:00 PM for advising in P 143.
Samuelsen: Filip.Samuelsen@stonybrook.edu, office hours TBA
Konkel: Austin.Konkel@stonybrook.edu, office hours TBA
For the most up-to-date information about office hours please consult our math department "web cards" by clicking the links on our names at the top of this document.

Main Textbook: Sheldon Axler, *Linear Algebra Done Right (4th ed.)*. This book is available for free as a downloadable pdf at the link above. Make sure that you get the fourth edition! All of the homework problems will come out of this textbook.

Description: Finite dimensional vector spaces, linear maps, dual spaces, bilinear functions, inner products. Additional topics such as canonical forms, multilinear algebra, numerical linear algebra.

Prerequisites: C or higher in MAT 211 or 305 or 308 or AMS 210; C or higher in MAT 200 or MAT 250 or permission of instructor

Grading: The course grade is a weighted average of scores on homework assignments (20%, spread evenly across assignments, lowest score dropped), two midterms (25% each), and the final (30%). A formula may be applied to overall homework assignment scores at the end of the semester, for the purpose of regularizing the median homework scores across the recitation sections. This will be done at the discretion of the professor, and it will only raise the overall homework score of the students in applicable recitation sections; it will never lower homework scores.

Lectures: If you miss a lecture, you are responsible for making up the missed materials and announcements by reviewing a friend's notes, reading the relevant textbook sections, consulting Brightspace for announcements, etc. In general, lectures will not be recorded and notes will not be posted online.

Homework: Homework is assigned via Brightspace on an approximately weekly basis and will be submitted in your recitation section during the week that it is due. Assignments should be clearly written or typed. **Late homework will not be accepted.** To account for unexpected situations that may arise, your lowest homework assignment score will be dropped before computing the overall course grade. A running list of the assigned problems is maintained under the "Homework assignments list" tab on Brightspace. For homework assignments collaboration is permitted, in fact encouraged, and external references such as class notes and the

textbook may be consulted; however, all submitted assignments must be written up independently and represent the student's own work and understanding.

Exams: The midterm exams will take place in class, during the usual class time and in the usual classroom. The final exam will take place during finals week, location TBA. The exams will take place on the dates listed below. No notes, calculators, or other external resources will be used during exams. Cell phones must be silenced and put away.

Students must attend and take all exams, except in the case of an emergency, religious observance, applicable SASC accommodation, or participation in an applicable university-sponsored activity. Students who may miss an exam due to participation in an applicable university-sponsored activity are responsible for presenting a printed copy of semester obligations to all their professors at the beginning of the semester. Students are expected to notify their professor as early as possible in advance of any religious observance for which they are requesting an accommodation. If you must miss an exam due to an emergency, please contact the professor as soon as possible.

Important Dates:

Midterm 1 . . . . Monday, October 7, 2024
Midterm 2 . . . . Wednesday, November 13, 2024
Final Exam . . . . . . Wednesday, December 11, 2024 , 11:15 AM – 1:45 PM

Photos of the board: Taking photos of the board is permitted, but I discourage the use of photos as a substitute for taking notes. If photographing the board becomes disruptive to the class, I will ask that you refrain from doing so. **Any photos taken in class should not include any people in them, including any classmates or the instructor. Photos taken in class should not be posted online or shared outside of the class.** Taking videos is not permitted.

Student Accessibility Support Center: If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact the Student Accessibility Support Center, Stony Brook Union Suite 107, (631) 632-6748, or at sasc@stonybrook.edu. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

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 is required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & 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/commcms/academic_integrity/index.html

Critical Incident Management: Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Student Conduct and Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.

Course Schedule (subject to change; see Brightspace for the most up-to-date version):
Week 1 (8/26, 8/28): Vector spaces and subspaces (1A, 1B, 1C)
Week 2 (9/2, 9/4): no class on 9/2, subspaces and span (1C, 2A)

Week 3 (9/9, 9/11): Linear independence, bases, dimension, linear maps (2B, 2C, 3A).

Week 4 (9/16, 9/18): Null space and range, matrices (3B, 3C).

Week 5 (9/23, 9/25): Invertibility, products and quotients (3D, 3E).

Week 6 (9/30, 10/2): Duality (3F), catch-up as needed.

Week 7 (10/7, 10/9): **Midterm on 10/7**, polynomials (Ch. 4).

Week 8 (10/14, 10/16): no class on 10/14, invariant subspaces (5A).

Week 9 (10/21, 10/23): Minimal polynomial, upper-triangular matrices (5B, 5C).

Week 10 (10/28, 10/30): Diagonalization, commuting operators (5D, 5E).

Week 11 (11/4, 11/6): Inner products and norms (6A), catch-up as needed.

Week 12 (11/11, 11/13): Orthonormal bases (6B), **Midterm on 11/13**.

Week 13 (11/18, 11/20): Orthogonal complements, self-adjoint and normal operators (6C, 7A).

Week 14 (11/25, 11/27): no class on 11/27, Spectral theorem (7B).

Week 15 (12/2, 12/4): Generalized eigenvectors, generalized eigenspace decomposition (8A, 8B).

Week 16 (12/9, 12/11): Consequences of 8B (8C), **final exam 12/11 11:15 AM − 1:45 PM**.