

SYLLABUS: EE 510

LINEAR ALGEBRA FOR ENGINEERING

Fall 2023
Lecture: T Th 2:00 – 3:50 pm
Section: 30479D
Venue: DEN@Viterbi

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Office: EEB 420 / Zoom
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Hours: Wed. 4:00pm – 6:00pm

Course Summary: The course introduces the main concepts of linear algebra with focus on concepts that are essential to solving problems in communication, control, and signal processing. The course depends primarily on lecture material and handouts. *Attendance is mandatory.*

Weekly COURSE OUTLINE

AUG 22: Introduction to linear algebra. Vectors and Matrices.
AUG 29: Systems of linear equations. Vector spaces.
SEPT 5: Subspaces. Linear independence. Bases and rank. Dimension.
SEPT 12: Inner Products. Orthogonality. Gram-Schmidt procedure.
SEPT 19: MIDTERM I. Linear Transformations.
SEPT 26: Discrete Fourier transform. Eigenvalues and eigenvectors.
OCT 3: Diagonalization. Unitary triangularization. Positive definite matrices.
OCT 10: Covariance matrices. No Class on Thursday: Fall Recess.
OCT 17: Whitening matrices. Singular value decomposition. Jordan form.
OCT 24: Markov matrices and convergence. Minimax game matrices.
OCT 31: Matrix calculus. Maximum likelihood techniques.
NOV 7: MIDTERM II. Gaussian mixtures for random vectors.
NOV 14: Ordinary and weighted least squares. Multicollinearity.
NOV 21: Penalized regression. No class on Thursday: Thanksgiving holiday.
NOV 28: Advanced applications. Review and final-exam preparation.
DEC 11: FINAL EXAM: 4:30 – 6:30pm

Textbooks

Required Text: Gilbert-Strang, *Introduction to Linear Algebra*, 5th edition Wellesley-Cambridge, 2016.

Recommended Text: Seymour Lipschutz, and Marc Lipson, *Schaum's Outlines for Linear Algebra*, 6th edition, McGraw-Hill Education, 2018.

Recommended Text: Richard C. Penney, *Linear Algebra Ideas and Applications*, 4th edition, Willey, 2016.

GRADING PROCEDURE

Summary: Class grade depends on two midterms and the final exam. The suggested homework problems are optional and worth at most 10 points of extra credit total. Students should work many more problems than these to master the material.

- 1. Midterm Exams. Closed book.** Cumulative. There are 2 midterm exams. 90 minutes per exam. No make-up exams. Each midterm is worth 25 points.
- 2. Final Exam.** Worth 50 points. Cumulative. **Closed book.**
- 3. Homework Problems.** Textbook problems are checked but not graded. Homework worth 10 points maximum. Students may discuss homework problems among themselves but each student must do his or her own work. Cheating warrants an F in the course. Turning in identical homework sets counts as cheating.
- 4. Course Grade.** 100 points possible in course.
 - A if 90 - 100 points
 - B if 80 - 89 points
 - C if 70 - 79 points
 - D if 60 - 69 points
 - F if 0 - 59 points .
- 5. Cheating.** Not tolerated on homework or exams. Penalty ranges from F on exam to F in course to recommended expulsion.
- 6. Statement for Students with Disabilities.** Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.
- 7. Statement on Academic Integrity.** USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. *Scampus*, the Student Guidebook, contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A:

<http://www.usc.edu/dept/publications/SCAMPUS/gov/>. Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: <http://www.usc.edu/student-affairs/SJACS/>.

8. Academic Conduct

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Section 11, *Behavior Violating University Standards* <https://scampus.usc.edu/1100-behavior-violating-university-standards-and-appropriate-sanctions>. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct>.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the *Office of Equity and Diversity* <http://equity.usc.edu> or to the *Department of Public Safety* <http://capsnet.usc.edu/department/department-public-safety/online-forms/contact-us>. This is important for the safety of the whole USC community. Another member of the university community – such as a friend, classmate, advisor, or faculty member – can help initiate the report, or can initiate the report on behalf of another person. *The Center for Women and Men* <http://www.usc.edu/student-affairs/cwm/> provides 24/7 confidential support, and the sexual assault resource center webpage <http://sarc.usc.edu> describes reporting options and other resources.

9. Support Systems

A number of USC’s schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the *American Language Institute* <http://dornsife.usc.edu/ali>, which sponsors courses and workshops specifically for international graduate students. *The Office of Disability Services and Programs* http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html provides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, *USC Emergency Information* <http://emergency.usc.edu> will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.