

USC Viterbi School of Engineering

EE510, Linear Algebra for Engineering

Units: 04

Term: Fall 2019; Day: Tue, Thu; Time: 2:00-3:50 pm

Location: THH210

Instructor: E. Jonckheere

Office: EEB306

Office Hours: Tu & Th., 10:00-12:00

Contact Info: jonckhee@usc.edu, (213) 740-4457

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Teaching Assistant: Ajinkya Jayawant

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Grader: Aishwarya Vijay Lohokare

Office: TBA

Office hours: TBA

Contact info: lohokare@usc.edu

IT Help: Group to contact for technological services, if applicable.

Hours of Service:

Contact Info: Email, phone number (office, cell), Skype, etc.

Course Description

This is a basic introductory course to formal linear algebra, viewed as a fundamental engineering technique with applications to control, signal processing, computer networks, machine learning, optimization, quantum information processing, to name just a few.

We will first follow the traditional curriculum, vector space, matrices, determinant, eigenvalues & eigenvectors, quadratic forms, numerical linear algebra, and finish with some advanced applications: linear programming, Max Born matrix mechanics.

Learning Objectives

Students will learn how *to think* in terms of linear algebra and vector spaces, even for problems that are, from their external appearance, remote from linear algebra.

Prerequisite(s): EE141L, Applied Linear Algebra for Engineering (Matlab)

Course Notes

Grading Type: letter grade

The course is Web-Enhanced (**Blackboard**).

Notes additional to required text will be posted by instructor & TA on Blackboard.

Classroom utilization of **Matlab** will be used as multimedia/technology-enhanced learning strategies.

Technological Proficiency and Hardware/Software Required

Students will be assumed to be familiar with Matlab.

Required Readings and Supplementary Materials

Required textbook: Gilbert Strang, *Linear Algebra and its Applications*. Forth Edition, Thomson Brooks/Cole. Belmont, CA, 2006.

Additional recommended text: N/A

Description and Assessment of Assignments

Students will be assigned a homework every other week. Homework will consist in solving textbook problems. There will be one midterm and one final.

Grading Breakdown

Assignment	Points	% of Grade
homework		15%
midterm		35%
final		50%
TOTAL	0	1
TOTAL		

Assignment Submission Policy

Homework to be submitted two weeks after assignment.

Additional Policies

Late assignments will be penalized (unless valid, e.g., medical, reason).

Attendance of the lectures is expected.

Matlab & Mathematica will be used in the classroom.

Course Schedule: A Weekly Breakdown

2019	Topics/Daily Activities	Textbook Chapters & Readings	Deliverable/ Due Dates
Week 1 Begin Aug. 26	Vector spaces; intuitive notion of vector	Strang, Chap. 2	
Week 2 Begins Sept. 2	Vector spaces; formalization	Strang, Chap. 2	Homework #1 assigned
Week 3 Sept. 09	Orthogonality; notion of inner product	Strang, Chap. 3	
Week 4 Sept. 16	Matrices; notion of linear transformations	Strang, Chap. 1	Homework #1 due, Homework#2 assigned.
Week 5 Sept. 23	Gauss elimination	Strang, Chap. 1	
Week 6 Begins Sept. 30	Determinants; geometric interpretation	Strang, Chap. 4	Homework #2 due, Homework#3 assigned.
Week 7 Begins Oct. 7	Determinants; exterior algebra interpretation	Strang, Chap. 4	
Week 8 Begins Oct. 14	Eigenvalues & Eigenvectors	Strang, Chap. 5	Homework #3 due, No homework assigned because of midterm
Week 9 Begins Oct. 21	Eigenvalues & Eigenvectors; algebraic theory	Strang, Chap. 5	Midterm Oct. 19
Week 10 Begins Oct. 28	Quadratic forms, positive definite matrices	Strang, Chapter 6	
Week 11 Begins Nov. 04	Quadratic forms, congruence, Sylvester's law of inertia	Strang, Chap. 6	Homework #4 assigned
Week 12 Begins Nov. 11	Numerical linear algebra; QR iteration	Strang, Chap. 7	
Week 13 Begins Nov. 18	Special topic: linear programming	Strang, Chap. 8	Homework #4 due, Homework#5 assigned.
Week 14 Begins Nov. 25	Special topic: matrices in quantum mechanics	Notes posted by instructor on blackboard	Thanksgiving recess Wd. Nov. 27-Dec. 01
Week 15 Begins Dec. 06	Review and preparation for final.		Last homework # 5 due.
FINAL Th. Dec. 12, 2:00-4:00 pm			Date: For the date and time of the final for this class, consult the USC <i>Schedule of Classes</i> at www.usc.edu/soc .

Statement on Academic Conduct and Support Systems

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 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 sarc@usc.edu describes reporting options and other resources.

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.