EE141L Applied Linear Algebra for Engineering

Course Syllabus

Term: Fall 2018 — Updated August 23, 2018[1]

Goals:

- Linear algebra concepts are fundamental to many areas in Engineering and beyond. Examples include among many others Communications, Control and Signal Processing, Machine Learning, Computer Vision, Computer Graphics.

- The main goal of this class is to master the basic tools and intuitions in Linear Algebra, both from theoretical/abstract and practical/programming perspectives. The emphasis will be on learning the language of linear algebra, and using it for problem solving.

- Towards this goal, throughout the semester, and for each of the topics to be covered, the goals will be to:

  – Introduce basic linear algebra concepts
  – Learn how to proof basic facts using these concepts
  – Discuss specific real world problems to understand how linear algebra tools can be applied
  – Learn basic Matlab programming in order to apply these tools to solve concrete problems

Instructor: Prof. Antonio Ortega, Department of Electrical Engineering, EEB 436 Phone (213) 740-2320, Fax (213) 740-4651, E-mail: ortega@sipi.usc.edu

Lecture: Tuesday and Thursday, 2:00-3:20pm, GFS 116

Discussion/Lab: Friday, 10:00-11:50am, TBD

Important Note: On specific weeks, Labs will be on Tuesday or Thursday and the Friday time will be used for Lecture. This will be announced in class and the schedule (see link below) will be updated accordingly.

Office Hours: Monday, 1:30-4:30pm, or by appointment, EEB 436.

Teaching Assistants: Cami Amein (UG), amein@usc.edu Emma Davitz (UG), davitz@usc.edu, Daeun Kim (G), daeunk@usc.edu, Alexander Serrano (G), serr196@usc.edu, Alexander Vilesov (UG), avilesov@usc.edu, Kevin Warasila (G), warasila@usc.edu

T.A. Office Hours: TBD

Grading: Labs/Homework (25%)   Midterm 1 (25%)   Midterm 2 (25%)   Final Exam (25%).

Exam dates: Midterm 1: TBD   Midterm 2: TBD   Final Exam: 12/6 2-4pm.

Blackboard: `https://blackboard.usc.edu`

Piazza: `http://piazza.com/usc/fall2018/ee141l`

Textbook:

- Richard C. Penney, *Linear Algebra: Ideas and Applications* 4th Edition (Wiley, 2016).

Up to date schedule: Click here

---

[1]This syllabus is subject to change and will be updated.

- Lecture topics

  - Introduction
  - Vectors, Matrices and Linear dependence, vector spaces
  - Systems of Equations and Rank
  - Gaussian elimination
  - Column Space and Nullity
  - Test for linear independence
  - Basis
  - Dimension
  - Rank Nullity Theorem
  - Matrix representation theorem
  - Matrix multiplication
  - Linear systems – composition
  - Inverses – Linear transformations
  - Inversion
  - Determinants
  - Cramer's rule
  - Scalar products, Distance
  - Projection and Approximation
  - Fourier Series, Orthogonal Matrices, Least squares
  - Eigenvectors
  - Quadratic forms, SVD
  - Complex eigenvectors
  - Generalized eigenvectors
  - Numerical techniques

- Labs

  - Intro to Matlab
  - Simple image processing
  - Traffic flow
  - Page Rank
  - Point clouds
  - Image transforms and JPEG
  - Linear regression
  - Netflix challenge

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. Website and contact information for DSP:
`http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html`,
(213) 740-0776 (Phone), (213) 740-6948 (TDD only), (213) 740-8216 (FAX) ability@usc.edu.

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 ones own academic work from misuse by others as well as to avoid using anothers work as ones own. All students are expected to understand and abide by these principles. SCampus, the Student Guidebook, (www.usc.edu/scampus or http://scampus.usc.edu) contains the University Student Conduct Code (see University Governance, Section 11.00), while the recommended sanctions are located in Appendix A.

Emergency Preparedness/Course Continuity in a Crisis : In case of a declared emergency if travel to campus is not feasible, USC executive leadership will announce an electronic way for instructors to teach students in their residence halls or homes using a combination of Blackboard, teleconferencing, and other technologies.