Introduction to Linear Dynamical Systems: Course Information

Professor Stephen Boyd, Stanford University, Autumn Quarter 2007–08

Lectures & section

Lectures: Tuesdays and Thursdays, 9:30–10:45 am, Terman Auditorium. Broadcast live on SITN channel E1 and available in streaming video format at SCPD.

Problem session: Mondays 4:15–5:05 pm, Gates B03. The problem session will be broadcast live on channel E4, and available in streaming video format from SCPD.

Textbook and optional references

There is no textbook. The course reader is available in bound form at the Stanford Bookstore.

Several texts can serve as auxiliary or reference texts:

- *Linear Algebra and its Applications*, or the newer book *Introduction to Linear Algebra*, G. Strang.
- *Introduction to Dynamic Systems*, Luenberger, Wiley.

You really won't need these books; we list them just in case you want to consult some other references.

Course requirements and grading

Requirements:

- Weekly homework assignments. Homework will normally be assigned each Thursday and due the following Thursday by 5 pm in the inbox outside Denise's office, Packard 267. **Late homework will not be accepted.** You are allowed, even encouraged, to work on the homework in small groups, but you must write up your own homework to hand in. Homework will be graded roughly, on a scale of 1–4.
- Midterm exam (24 hour take home—Oct. 26–27 or Oct. 27–28 (your choice))
- Final exam (24 hour take home—tentatively Dec. 7–8 or Dec. 8–9)

Grading: Homework 15%, midterm 40%, final 45%. These weights are approximate; we reserve the right to change them later.

Prerequisites

Exposure to linear algebra and matrices (as in Math. 103). You should have seen the following topics: matrices and vectors, (introductory) linear algebra;

differential equations, Laplace transform, transfer functions. Exposure to topics such as control systems, circuits, signals and systems, or dynamics is not required, but can increase your appreciation.

Catalog description

Introduction to applied linear algebra and linear dynamical systems, with applications to circuits, signal processing, communications, and control systems. Topics include: Least-squares aproximations of over-determined equations and least-norm solutions of underdetermined equations. Symmetric matrices, matrix norm and singular value decomposition. Eigenvalues, left and right eigenvectors, and dynamical interpretation. Matrix exponential, stability, and asymptotic behavior. Multi-input multi-output systems, impulse and step matrices; convolution and transfer matrix descriptions. Control, reachability, state transfer, and least-norm inputs. Observability and least-squares state estimation. EE263 covers some of the same topics, but is complementary to, CME200.

3 Units. Typically taught Autumn and Spring quarters.