

ESE551 — Linear Dynamic Systems

Fall 2017

Instructor: Shen Zeng

Website: <https://sites.wustl.edu/systems/teaching/fall-2017-ese-551/>

Prerequisites: ESE351 (Signals and Systems) or equivalent, in particular a solid familiarity with differential equations and basic concepts from linear algebra.

Lectures: Duncker Hall 101, Mondays and Wednesdays 4pm–5:30pm.

Office Hours: Green Hall 1120A, Thursdays 4pm–5pm, or by appointment.

Grading policy

Homework: 35%. Biweekly, consisting of theoretical and computational exercises.

Midterm Exam: 30%. Wednesday October 11, during lecture. Open book.

Final Exam: 35%. Friday December 15, 6pm–8pm. Room TBA. Covers all the material in the semester. Open book.

Course outline

Linear Differential Equations: Motivation, fundamental solution and transition matrix, stability theory, connections to results from Linear Algebra

Linear Systems: Linear systems with inputs and outputs, variation of constants formula, system interconnections, relationship with frequency domain approaches

Controllability and State Feedback: The concept of controllability, point-to-point control, Kalman decomposition, relation to pole placement by state feedback

Observability and Observers: The concept of observability, duality between controllability and observability, Luenberger observer, separation principle for observer-based feedback mechanisms

Least Squares Theory: Linear quadratic regulator (LQR) theory, Kalman filter

Realization Theory: Realizations of input/output-descriptions, model reduction by balanced truncation