

Main Topics

1. Review of MIMO Linear Systems

- definition of system gain, cost functions, and norms
- pole placement by state feedback
- observer-based regulators

2. Stability Robustness

- classical (Nyquist) results for SISO systems
- unstructured uncertainty norm-based results for MIMO systems
- relationship between classical and norm-based robustness

3. The Linear Quadratic Regulator

- multivariable constrained optimization
- the Hamiltonian and matrix Riccati equations
- LQR robustness properties

4. The Kalman Filter

- vector-valued random processes and linear systems
- recursive minimum mean-squared error estimation (MMSE)
- computation of the Kalman gain

5. Linear Quadratic Gaussian Control

- the stochastic regulator
- combined stochastic estimation and control
- LQG robustness and loop-transfer recovery (LTR)

6. Additional Topics

- extension of design and robustness analysis to MIMO tracking systems
- pole-placement H_∞ control system design (recent research results)

Instructor

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Grading

Homework: 25%
Midterm: 35%
Final Exam: 40%

Exams

Midterm Exam
Final Exam (May 6, 3-6 pm)

Textbook**Linear Optimal Control**

by J.B. Burl
Addison Wesley Longman, 1999