CDS 231. Linear Systems Theory. 9 units (3-2-4); first term. Prerequisites: CMS/ACM 107 and CMS/ACM 113 or equivalent (may be taken concurrently). Linear input/output models (multi-state difference and differential equations). Stability, input/output norms. Uncertainty, including noise, disturbances, parametric uncertainty, unmodeled dynamics, and structured uncertainty (LTI/LTV). Tradeoffs, robustness versus efficiency, conservation laws and hard limits in time and frequency domain. Synthesis of robust control systems. Motivating case studies from tech, neuro, bio, and socioeconomic networks. Additional topics (as time permits): polytime scalability, sparsity, structure; layering and architecture; delay versus warning; communication and computing limits, quantization; actuator saturation, nonlinear dynamics, sum of squares, global stability, regions of attraction. Instructor: Doyle.