University of Maryland at College Park
Dept. of Aerospace Engineering

ENAE 432: Aerospace Control Systems

Topical Outline:

Unit I: Linear System Response

1. Review: differential equations and complex numbers
2. Laplace transforms and transfer functions (Chap 2)
3. Transient and steady-state responses; stability, settling time (Chap 4)
4. State-space models and transfer functions (Chap 3)
5. First and second order responses; overshoot and damping ratio (Chap 4)
6. General transient responses: poles and zeros (Chap 4)
7. Sinusoidal forced response (Chap 10)
8. Bode/polar/Nichols diagrams (Chap 10)

Unit II: Feedback Analysis and Synthesis

9. Feedback systems: closed-loop dynamics (Chap 5)
10. Closed-loop stability via Nyquist analysis (Chap 10)
11. Relative stability: phase and gain margins (Chap 10)
12. Tracking performance; internal model principle constraints (Chap 7)
13. Compensation design using Bode diagrams (Chap 11)
14. Common compensators: P/PD/PI/PID, lead, lag (Chap 9, 11)
15. Effect of delay, disturbances, and sensor noise
16. Effect of model uncertainty; stability robustness
17. Closed-loop stability via root locus analysis (Chap 8)
18. Compensation design via root locus analysis (Chap 9)
19. Digital implementation of control strategies (Chap 13)
20. Introduction to state feedback (Chap 12)

Exam #1: Mar 14, covers approx Weeks 1-6 (HW 1-5).

Exam #2: May 2, covers approx Weeks 7-12 (HW 6-10).

Final Project: due before noon on May 19