# THE DEPARTMENT OF AERONAUTICS AND ASTRONAUTICS

## *AA 447 CONTROL IN AEROSPACE SYSTEMS*

### AUTUMN QUARTER

**CREDITS AND CONTACT HOURS:** 4 credits, Four 50-minute lecture sessions and one-hour laboratory per week.

**COORDINATOR:** Kristi Morgansen, Assistant Professor

**TEXTBOOK:** Feedback Control of Dynamic Systems, Franklin, G. F., J. D. Powell & A. Emami-Naeini, 3rd ed., Addison-Wesley Publishing Co., 1994.

**SUPPLEMENTAL MATERIALS:** Introduction to Automatic Control Systems, Clark, R. N., Wiley, 1992 (to be superseded by Control System Dynamics, Cambridge Univ. Press, 1995).

**CATALOG DATA:** CONTROL IN AEROSPACE SYSTEMS, Required
Overview of feedback control. Dynamic models for control systems design including ODE, transfer function, and state-space. Linearization of nonlinear models. Analysis of stability, controllability, observability, time/frequency domain techniques. Frequency response design techniques. Design of control systems via case studies. Prerequisite: ME 230; MATH 308, minimum 1.7 in AA 312. Offered: A.

**PREREQUISITES BY TOPIC:**
1) Differential equations
2) Engineering dynamics

**OUTCOMES:**
1) Learn the fundamentals of linear control systems.
2) Prepare the student to do practical control system design using computer aided control systems design tools.

**RELATIONSHIP TO STUDENT OUTCOMES:**
a) An ability to apply knowledge of mathematics, science, and engineering.
c) An ability to design a system, component, or process to meet desired needs.
e) An ability to identify, formulate, and solve engineering problems.
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**TOPICS:**
1) Modeling of dynamic systems by ordinary differential equations, state space forms, linearization, model properties.
2) Laplace transforms, transfer functions, pole-zero analysis.
3) Feedback control system configuration, closed loop transfer functions.
4) Performance specifications: time domain and frequency domain.
5) Frequency domain representation, methods of Bode and Nyquist Stability margins.
6) Design series and parallel compensators by root locus techniques.

7) Design using frequency domain techniques.