ASEN 5002: Introduction to Dynamics of Aerospace Structures (Spring, 1998)

Instructor: K. C. Park (ECAE 185, 492-6330, E-Mail: kcpark@titan.colorado.edu)
Textbook: **Principles and Techniques of Vibrations** by L. Meirovitch.
Time/Place: TTh 3:30 – 4:45 / (ECCR 139), Prerequisites: ASEN 5012 or Equivalent

Course Outline

I. Fundamentals of Dynamics (10 lectures)
- Examples of aerospace dynamical systems.
- Modeling, analysis, testing of aerospace dynamic problems.
- Elements of Analytical Dynamics.
  - Kinematics: Cartesian and curvilinear coordinates.
  - Dynamics of a particle and of systems of particles.
  - Dynamics of rigid bodies.
  - Principle of virtual work.
  - D'Alembert's principle.
  - Lagrange's equations.
- Discrete-Parameter Systems
- Distributed-Parameter Systems
- Stability of dynamic systems: gyroscope, flutter, etc.

II. Methods of Structural Dynamics Analysis (10 lectures)
- Examples of aerospace structural vibrations.
- Response of first and second-order systems.
- Eigenvalue techniques for solution of modes and mode shapes.
- Generalized coordinates: solution in terms of normal modes.
- Frequency domain analysis: spectral, analytical and numerical methods.
- Time domain analysis: transient analysis methods.
- Shock response modeling and computations: landing, spacecraft separation, etc.

III. Advanced Topics in Dynamics and Their Applications (7 lectures)
- Constraints on dynamics systems: holonomic and nonholonomic.
- State space modeling of aerospace dynamics and control.
- Vibration measurements and vibration records analysis.
- Examples of active research topics in aerospace dynamics

Grading

Homework 25%. Reading assignment quizes 15%. Two quizes 30%, @ 15% each. Final exam 30%.