1. Course Number: AE 6532  
2. Hours:  
   - Lecture: 3  
   - Lab: 0  
   - Recitation: 0  
   Total Semester Credit: 3

3. Descriptive Title: Aerospace Robust Control II

4. Recommended Abbreviation for Transcript: AEROBUSTCON. II.


6. Basis: L/G X  
   - P/F: X  
   - Audit: X

7. Prerequisites: Graduate Standing  
   Corequisites:  
   - Note: Course can NOT be approved without a listed prerequisite or corequisite. (Undergraduate Only)

8. Expected Mode of Presentation:  
   - Lecture: 100%
   - Laboratory- Supervised  
     Unsupervised
   - Discussion
   - Seminar
   - Independent Study
   - Library Work
   - Demonstration
   - Other (Specify)

9. Planned Frequency of Offering:  
   - Every year
   - Expected Enrollment: 25

10. Are you requesting that this course satisfy: Humanities  
    Social Science  
    (Must be 1000 or 2000 level)

11. Probable instructor(s): Wassim Haddad

12. To replace what course or courses in quarter system?  
    AE 6532

13. Required  
    Elective X

14. Please attach a topical outline of the course.
Catalog Description: AE 6532 Aerospace Robust control II. 3-0-3. Prerequisite: AE 6531

Advanced treatment of robustness issues. Controller analysis and design for linear and nonlinear systems with structured and non-structured uncertainty. Reduced-order control, stability multipliers, and mixed-mu.

Coordinator: Wassim Haddad, Associate Professor

Course Objective: To provide students with an advanced treatment of linear and nonlinear robust control as applied to aerospace systems.

Recommended Textbooks:


Topics:

The Standard H sub 2 Problem
- Riccati Equation Characterization for H sub 2
- Disturbance Rejection as a Standard Problem
- Unstructured Uncertainty Models
- The H sub 2 LQR Problem
- The H sub 2 Dynamic Compensation Problem
- The Mixed-Norm H 2/H sub 2 Problem
- Specialization to H sub 2 Dynamic Compensation
- Robust Controller Synthesis Using the Mixed-Norm H 2/H sub 2 Standard Problem
- H2/μ Synthesis

Fixed-Structure Controller Synthesis
- Reduced-Order Dynamic Compensation
- The Optimal Projection Equations
- Suboptimal Model Reduction via Balanced Realizations
- Optimal H2 Model Reduction
- Mixed-norm H2/H sub 2 Extensions
- Decentralized Controller Architectures

Robust Analysis and Synthesis for Structured Real Parameter Uncertainty
- Robust Analysis
- Parameter Uncertainty Models
- Robust Stability and Robust Performance
- Fixed Quadratic Lyapunov Bounds for Robust Analysis and Synthesis
- Construction of Lyapunov Bounds: Linear Bound, Quadratic Bound
- The Robust LQR Problem
- The Robust Estimation Problem
- Robust Full-Order Dynamic Compensation
- Robust Mixed-Norm H2/H sub 2 Extensions
- Real Parameter Uncertainty and Parameter-Dependent Lyapunov Functions
- Popov Robustness and Controller Synthesis
- Connections to Absolute Stability Theory
The Real Structured Singular Value
- Mixed Complex/Real Uncertainty Models
- Nonlinear Uncertainty Models
- Connections to Absolute Stability Theory
- Multiple-Block Structured Uncertainty
- Real-µ Analysis
- Fixed-Structure $H_2/µ$ Synthesis

Advanced Topics in Linear and Nonlinear Robust Control

**Computers:** Several assignments will require computations using MATLAB, Control System Toolbox, and the µ-Toolbox.