THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Fundamentals of Flight Vehicle Control

AEROENG 3521

Credit Hours:
3.00

Course Levels:
Undergraduate (1000-5000 level)

Course Components:
Lecture
Recitation

Course Description:
Linear dynamic systems analysis using Transfer function (Laplace Transformation based) methods and State Space (matrix theory based) methods with emphasis on aircraft and spacecraft models.

Prerequisites and Co-requisites:
Prereq: 3520, and enrollment as AeroEng-BS student (No pre-majors can enroll in this class).

Course Goals / Objectives:
- Understanding and appreciation of common features of linear time-invariant (LTI) systems encountered in various engineering disciplines
- Obtain the responses of LTI systems and quantify their performances both within open-loop and closed-loop environments
- Cast various mechanical, aerospace, electrical and electro-mechanical systems into forms amenable to the methods they learn in this course
- Identification of characteristic parameters of LTI's from the studies of experimental/test responses

Course Topics:

- Fundamentals of dynamic systems
- Review of solution of differential equations by the Laplace transform methods
- Block-Diagram Algebra
- First -order Linear (LTI) systems Vehicle Simulations : Aircraft lateral and longitudinal dynamics simulations via transfer functions and MATLAB; Spacecraft attitude and rendezvous dynamics simulations via transfer functions and MATLAB
- (LTI) Frequency-domain (Frequency Response) specifications. Connection between time domain and frequency domain, specifications and Bode plots. MATLAB Utility functions; Stability of LTI systems – Routh-Hurwitz criterion; Root Locus Technique
- Multivariable (LTI) systems - State space (Time-domain) representation: The connection between state space and transfer function viewpoints , State-space Transition and Response by simulation; MATLAB Utility functions;
- Vehicle Simulations : Aircraft lateral and longitudinal dynamics simulations via state-space and MATLAB; Spacecraft attitude and rendezvous dynamics simulations via state-space and MATLAB
- Introduction to Digital systems: discrete difference equations, z-transform, sample and hold discrete sytems; block diagramming and open and closed-loop transfer functions, z-transform inversion, frequency domain in the z-plane.
- Response to random inputs: Mean, variance, RMS, Fourier transform, Power spectral density, mean square response to random inputs, gust and launch responses, MATLAB utility functions

---

Designation:
Required