

UA 505- Modeling and Linear Dynamical System Simulation

Course Code:	UA-505
UTAA Credit (Theoretical-Laboratory hours/week):	3(3-0)
ECTS Credit:	6.0
Department:	Unmanned and Autonomous System Engineering
Language of Instruction:	English
Level of Study:	Graduate
Offered Semester:	Fall and Spring Semesters.

Course Objectives

The aim of this course is to provide basic modeling skills to graduate students by creating mathematical models of simulated multi-domain engineering systems for system performance analysis and control system design. This course covers modeling, analysis and simulation of dynamical systems. Various tools are taught, including transfer functions, state space equations, block diagrams, and bond graphs. Analysis techniques such as vector analysis, vector and matrix norms, matrix theory including eigenvectors and eigenvalues, operators and matrices involving solving systems of linear equations will be taught. It includes additional topics such as linearization of dynamic systems, input-output definitions of systems, observability analysis, control and stability. Application examples range from aircraft and spacecraft, electrical circuits, fluid, thermal systems and electro-mechanical systems. Concepts involving discrete time systems will also be taught. Linear algebra is recommended as a background course.

Course Content

Introduction to the Linear system

Mechanical, Electrical, Thermal and Fluid system modeling

Hybrid system modeling

State-space representation of linear systems and Dynamic analysis

Simulation and analysis with MATLAB

Case studies and feedback control in simulation space

Course Learning Outcomes

1-Dynamic system modeling

2-Dynamic system analysis

3-Dynamic system simulation