UA 511- Automatic Flight Control Systems

Course Code:	UA-511
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

Learning basic concepts of flight mechanics, static ve dynamic stability and control. Deriving flight dynamic equations, seperation of longitudinal and lateral-directional motion modes. Going over longitudinal and lateral-directional static and dynamic stability derivatives. Analysis of flight equations and characteristics and design of automatic control systems. Learning longitudinal and lateral-directional autopilot types and their design methods.

C**ourse Content**

Introduction. Basic definitions of flight mechanics, control and control surfaces. General structure of flight control systems. Aircraft static and dynamic stability and stability derivatives. Static longitudinal and lateral stability. Aircraft longitudinal and lateral dynamic equations. Nonlinear dynamic equations. Linearization of equations. Longitudinal and lateral transfer functions. Longutinal modes of motion. Short and long period approximation. Transient response of aircraft dynamic. Basic concept of aircraft control systems. The types of autopilot. Autopilot design. Design of displacement autopilot by the Root Locus method. Inner and outer loop concepts. Pitch orientational control system. Root locus analysis. Acceleration control system. Matlab Simulink simulation of aircraft autopilots.

Course Learning Outcomes

1-understanding the basic definitions of flight mechanics, control, and control surfaces

2-have a basic knowledge on aircraft static and dynamic stability and stability derivatives

3-have a knowledge about aircraft dynamic equations, nonlinear dynamics, linearization and transfer functions

4-be able to understand longitudinal modes of the motion; longitudinal stability derivatives, short and phugoid modes

5-be able to understand Longitudinal transfer functions , analyse transient and steady state response for elevator displacement

6-be able to understand the basic concepts of the aircraft control systems; longitudinal autopilot design

7-have a knowledge about the types of autopilots and design methods

8-be able to apply root locus analyze method to the displacement autopilots

9-Understand pitch and acceleration aircraft control system design methods

10-To have a knowledge of MATLAB/SIMULINK programming in aircraft dynamic and control systems