UA 503- Applied Optimal Control

Course Code:	UA-503
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

To understand the essential features of the optimal control theories based on both Pontryagin's maximum principle and Bellman's dynamic programming. To learn designing state and output feedback optimal controls for linear plant models by using both Riccati and Lyapunov algebraic matrix equations. To learn the impact of controllability and observability of linear models of dynamic processes on control design. To learn the essence of Lyapunov theory of stability of system's operating equilibrium for both nonlinear and linear systems.

C**ourse Content**

Real-world dynamical processes, non-linear systems and optimal control. A review of advanced concepts in linear systems theory. A review Lyapunov stability theory. Pole-placement control design. Control design using state estimators. Theory of Pontryagin's maximum principle in optimal control. Theory of Bellman's dynamic programming in optimal control. Pontryagin's maximum principle for optimal control of linear systems: Riccati and Lyapunov equations. The optimal state regulator. The optimal output regulator. Feedback regulator systems via classical control.

Course Learning Outcomes

1-Effective understanding of non-linear nature of real-world dynamic processes and the necessity for their linear model representations.

2-Effective knowledge on structural system properties of controllability and observability for linear models and their impact on designing controls

3-Effective knowledge on Lyapunov theory of stability of system's operating equilibrium for both nonlinear and linear systems.