ITMO University

Modern Control Systems

Course Workload		Assessment form (examination/ graded test/ ungraded test)
ECTS	Hours	
3	108	Exam

The aim of this discipline is to consider the modern control systems such as adaptive, robust, and optimal control systems. The discipline goes over the fundamental algorithms of adaptive, robust, and optimal control for scalar and multidimensional plants, with the state vector being either measurable and immeasurable. Attention is paid to the plants parameterization used for parameters identification, adaptive state observers design and model reference adaptive control as well.

Course structure:

1. Basis of control theory

1.1. State-Space and Input-Output Forms
1.2. Structural Properties
1.3. Dynamical Properties
1.4. Pole-Placement Stabilization
1.5. State Observer Design

2. Optimal control

2.1. Calculus of variations
2.2. Linear Quadratic Regulator
2.3. Linear Quadratic Gaussian Regulator (Kalman Filter)
2.4. H∞-control

3. Adaptive Control for Linear Plants

3.1. Lyapunov function method
3.2. Adaptive Control for Scalar Plants
3.3. Adaptive Control for Multidimensional Plants

4. Robust Control for Linear Plants

4.1. Control for Disturbed Systems. Robustness
4.2. Robust Control for Scalar Plants
4.3. Robust Control for Multidimensional Plants

5. Adaptive Compensation of Unknown Multi-harmonic Disturbances

5.1. Observer for Disturbance Model Exosystem State