ITMO University

Optimal Control

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

Discipline deals with optimal control design for a dynamical systems or plants, that described by differential equations.

Course structure:

1. Static optimization

1.1. Method of Lagrange multipliers
1.2. Methods of static optimization
1.3. Kuhn–Tucker conditions
1.4. Necessary and sufficient conditions for function extrema

2. Optimal control problem statement

2.1. The problem of optimal control. Formulation. Examples
2.2. Classical cost function in the Lagrange, Bolza, and Mayer forms
2.3. The definitions of the Lagrangian and Hamiltonian

3. Variation Calculus

3.1. Euler–Lagrange equation
3.2. Linear quadratic regulator

4. Pontryagin's maximum principle

4.1. Legendre condition
4.2. Transversality conditions
4.3. The problem with free state points and fixed time
4.4. The problems with fixed state and time points

5. Dynamic programming

5.1. Optimal Control of a Discrete System
5.2. Bellman’s Principle of Optimality
5.3. Hamilton-Jacobi-Bellman Equation

6. Kalman filter

6.1. Optimal State Estimation
6.2. Kalman-Bucy Filter