**Practical course of the optimization control theory**

**Tickets**

**Part 1**

1. General optimization control problem. Problem statement.
2. General optimization control problem. Necessary condition of optimality.
3. General optimization control problem. Maximum principle.
4. General optimization control problem. Idea of numerical solving.
5. General optimization control problem. Iterative method.
6. Example of the easiest optimization control problem. Maximum principle.
7. Example of the easiest optimization control problem. Algorithm of the iterative method.
8. Example of the easiest optimization control problem. Convergence of the iterative method.
9. Example of the insufficient conditions of optimality. Problem statement.
10. Example of the insufficient conditions of optimality. Necessary conditions of optimality.
11. Example of the insufficient conditions of optimality. Non-uniqueness of the optimal control.
12. Example of the insufficient conditions of optimality. Discontinuous solution
13. Example of the insufficient conditions of optimality. Non-sufficiently of the optimality conditions.
14. Analysis of the sufficiently of the optimality conditions for the general optimization control problem.
15. General theorem of uniqueness of the optimal control.
16. Convexity of the set and the functional
17. Example of the singular control. Problem statement.
18. Example of the singular control. Necessary conditions of optimality.
19. Example of the singular control. Phenomenon of the singular control.
20. The singular control for the maximization problem.

**Part 2**

1. Example of the optimization problem with unique singular control.
2. Kelly’s condition for the singular control.
3. Example of the non-sufficiently of Kelly’s condition
4. General optimization control problem with singular control.
5. Example of the insolvable optimization control problem. Problem statement.
6. Example of the insolvable optimization control problem. Maximum principle.
7. Example of the insolvable optimization control problem. Analysis of the optimality conditions.
8. Example of the insolvable optimization control problem. Infimum of the functional.
9. Example of the insolvable optimization control problem. Minimizing sequence.
10. Example of the insolvable optimization control problem. Absence of the optimal control.
11. Convexity of the set and the functional.
12. General theorem of existence of the optimal control.
13. Convexity of the quadratic function.
14. Convexity of the quadratic functional.
15. General optimization control problem with fixed final state. Necessary conditions of optimality.
16. General optimization control problem with fixed final state. Practical solving.
17. General optimization control problem with fixed final state. Iterative method.
18. Example of the insolvable optimization control problem fixed final state. Problem statement.
19. Example of the insolvable optimization control problem fixed final state. Maximum principle.
20. Example of the insolvable optimization control problem fixed final state. Minimizing sequence.

**Part 3**

1. Example of the insolvable optimization control problem fixed final state. Analysis of the optimality conditions.
2. Example of the insolvable optimization control problem fixed final state. Proof of the insolvability of the optimization control problem.
3. Example of the insolvable optimization control problem fixed final state. Proof of the insolvability of the optimality conditions.
4. Stationary condition for the function with one variable.
5. Convexity of the set and the functional.
6. Example of Tihonov ill-posed control problem. Problem statement.
7. Example of Tihonov ill-posed control problem. Maximum principle.
8. Example of Tihonov ill-posed control problem. Optimal control.
9. Example of Tihonov ill-posed control problem. Proof of the ill-posedness.
10. Tihonov well-posedness of the optimization control problem.
11. Tihonov ill-posedness of the optimization control problem and regularization method.
12. Example of Hadamard ill-posed control problem. Maximum principle.
13. Example of Hadamard ill-posed control problem. Optimal control.
14. Example of Hadamard ill-posed control problem. Proof of the ill-posedness.
15. Hadamard well-posedness of the optimization control problem.
16. Hadamard ill-posedness of the optimization control problem and regularization method.
17. Optimization problem with isoperimetric condition. Problem statement.
18. Optimization problem with isoperimetric condition. Optimality conditions.
19. Optimization problem with isoperimetric condition. Non-uniqueness of the solution.
20. Bifurcation of extremals. Idea.