

Variational calculus and optimal control

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Variational calculus is field of analysis that studies extremal properties of linear functionals, if that functionals are mappings from a set of functions to the real numbers. Optimal control theory is an extension of the calculus of variations and differential equations. The optimal control theory study the optimal solutions of the systems with control parameter.

The course will cover a selection of the following topics:

- Necessary condition for an extremum. Euler–Lagrange equation.
- Lagrange multiplier method
- Sufficient condition for an extremum of linear functional. Theory of the second variation.
- Fundamentals of the theory of optimal control. Pontryagin’s maximum principle.
- Elements of convex analysis.
- Applications.

Books

- [1] V. M. Alekseev, V. M. Tikhomirov, S. V. Fomin, Optimal Control, Contemporary Soviet mathematics, Springer, 1987.
- [2] M.I. Zelikin, Optimal Control and Variational Calculus (Russian), URSS, 2004.