



# Proposals for cooperation

of System Analysis and Control department  
of National Technical University «Kharkiv Polytechnical  
Institute»



# About System Analysis and Control department

- Head of the Department  
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- Department provide full-time training and learning [Bachelor (BA); Master's (MA); Doctor of Philosophy (PhD)] by specialties
  - System Analysis
  - Computer Science and Information Technologies
- Department provide full-time training and learning [Bachelor (BA)] by specialty
  - Publishing and Printing



# Top publications

- Severin V. P. Vector Optimization of the Integral Quadratic Estimates for Automatic Control Systems / V. P. Severin // Journal of Computer and Systems Sciences International. – 2005. – Vol. 44. – P. 207-216
- Aleksandrov Ye. Ye. Parametric Synthesis of Digital Stabilization System of Tank Gun / Ye. Ye. Aleksandrov, T. Ye. Aleksandrova // Journal of Automation and Information Sciences. – 2015. – Vol. 47(11). – P. 1-17
- Lyubchyk L. M. Robust model predictive control of constrained supply networks via invariant ellipsoids technique / L. M. Lyubchyk, Y. I. Dorofieiev, A. A. Nikulchenko // IFAC Proceedings Volumes. – 2013. – Vol. 46(9). – P. 1596-1601
- Dorofeev Yu. I. Robust stabilizing inventory control in supply networks under uncertainty of external demand and supply time-delays / Y. I. Dorofieiev, L. M. Lyubchyk, A. A. Nikulchenko // Journal of Computer and System Science International. – 2014. – Vol. 53 (5). – P. 761-755
- Marchenko I. G. Particle transport in space-periodic potentials in underdamped systems/ I. G. Marchenko, I. I. Marchenko, A. V. Zhiglo // The European Physical Journal B. – 2014. – Vol. 87. – P. 1-7



# Proposal for collaboration

Identification, Analysis  
And Synthesis Of Complex  
Automatic Control Systems  
Based On Multicriteria  
Optimization



# The aim of the project

The aim of the proposed project is the theoretical development and practical implementation of the concept for the identification, analysis and synthesis of complex systems of automatic control system (ACS) on the basis of models and methods for multicriteria optimization, whose specific features are broad effective formalization opportunities of the tasks of identification and optimization, assignment of the desired values of quality indexes, high-order systems optimization with many variable parameters.



# Brief description

In order to solve the various problems of analysis and synthesis of ACS optimization methods laboratory OPTLAB is successfully used. For solving new tasks OPTLAB advances in the following areas: improvement of the program structure for solving the complex inter-related problems of identification, analysis and synthesis of linear and non-linear ACS; improvement simulation and analysis ACS unit on the basis the solution programs of nonlinear systems of differential equations with different types of input variables; creation of a universal identification parameters ACS unit based on experimental transition process of input and output variables; improvement of quality indicators ACS units on the basis of the stability criteria of linear and nonlinear ACS, improved integral quadratic estimates and direct indicators of quality; extension of the class of vector objective functions (VOF) for typical problems of identification and synthesis of ACS with the conditions required by the stability and quality indicators; extension programs VOF optimization methods and increasing their efficiency in solving problems of identification and synthesis of complex nonlinear ACS.



# Expected results

- The theoretical propositions to improve the reliability and quality of automatic control systems, optimization of complex systems and the objects in the design phase and development on their basis of new technical solutions in the field of power engineering.
- Based on mathematical modeling of WWER-1000 nuclear power plant the perspective concept of synthesis of control systems for power units of power plants is developed. It is based on mathematical models and numerical methods for vector optimization of systems of quality indicators, which improves the degree of scientific validity of technical projects to improve the control systems of power units.