



FACULTY  
OF ECONOMICS



# MATHEMATICAL MODELLING OF ENGINEERING AND ECONOMIC SYSTEMS

MASTER'S DEGREE PROGRAMME



## PROGRAM ADVANTAGES

- ✔ The Program has a multifunctional and interdisciplinary nature. The competencies obtained by students are key in addressing the problems of production and economy digitalization, building a high level of the country's economy competitive capacity to secure Russia's national security and independence, as well as the competitiveness of Russian companies.
- ✔ Training of high-end new generation engineers and economists who will be able to think in terms of technical and economic framework in the context of contemporary digital economy and economy of knowledge.
- ✔ The Program has been commissioned by and developed in cooperation with the Russian Space Systems (JSC RSS).
- ✔ Curriculum and syllabus have been developed in cooperation with the partner company.
- ✔ Every master student receives a corporate mentor.
- ✔ Subjects of graduation thesis and course papers is determined by the goals and needs of the commissioner, while the students' progress is guided by highly competent industry experts.
- ✔ Internships and research activity take place at enterprises in need of high-skilled personnel with relevant qualifications.
- ✔ The most talented individuals through a competition get the opportunity to find employment with the partnering companies, with the candidates selected for the jobs subject to the competencies obtained by them over the course of study.
- ✔ Possibility to design an individual academic schedule. Master degree classes take place in the evenings, which allows to have work-study integration.



# STUDYING PROCCESS

**120** credits.

The curriculum includes lectures, practicums and self-study, research activity on the master level (1st and 2nd years of tuition) and pre-graduate practice (2nd year)



## COMPUTER-ASSISTED DESIGN OF CONTROL INSTRUMENTS AND SYSTEMS

- Key areas of research in computer-assisted design of control instruments and systems.
- Mathematical modelling of computer-aided engineering systems.
- Application software (CAE/CAD/CAM systems).



## COMPUTER-ASSISTED MANAGEMENT TECHNOLOGIES IN ENGINEERING SYSTEMS

- Computer-assisted technologies.
- Principles of telecommunication network data transmission.
- Technologies of complex engineering systems management.



## MATHEMATICAL MODELLING OF OBJECTS AND MANAGEMENT SYSTEMS

- Goals of grouping in multiple participant systems.
- Decision-making in the multiobjective environment.
- ERP objectives.
- Branch and bound algorithm. Some variation calculus problems.



## MANAGEMENT AND INFORMATION SYSTEMS DESIGN

- Informations systems design and performance analysis.
- Analysis and design methods.
- Project Management. MS PROJECT.



## APPLICATION PROGRAMMING IN HIGH-LEVEL LANGUAGES

- C# algorithm development and programming.
- Key C# programming technologies.
- Designing graphical user interfaces.





## **OPERATIONS AND GAME THEORY RESEARCH**

- Methodological, Economic and Mathematical background or operations research.
- Instrumental Methods of operations and game theory research.
- Optimal network resource allocation.



## **SIMULATION MODELLING AND RANDOM PROCESSES**

- Simulation modelling.
- Dynamical systems.
- Dynamical systems as objects of simulation modelling.
- Modelling of random processes.
- Simulation modelling of complex economic entities.



## **ARTIFICIAL INTELLIGENCE METHODOLOGY**

- Main problems solvable through AI.
- Key artificial intelligence theory models.
- Knowledge-based methods and expert systems.



## **MATHEMATICAL ECONOMICS**

- Evolutionary optimization methods.
- Genetic algorithms.
- Swarm intelligence.
- Kohonen network.
- Clustering goals.
- Decision trees.
- Binary trees.
- Red/black trees.
- Expert systems.
- Reinforcement learning.
- Game theory in Economics.
- Artificial intelligence in lean production.



# HEAD OF THE PROGRAMME

## ROMAN SHAMIN



Dr. Sci. in Physics and Mathematics, Professor of Mathematical Modelling and Information Technologies Department at RUDN's Center for Industries Management.

**Ph.D. thesis for the Doctor of Economics degree:** Modelling Abnormally Large Ocean Surface Waves.

### AREAS OF RESEARCH CONCENTRATION:

Computational Experiments, Mathematical Modelling, Numerical Computing Methods. Differential Equations, Functional Analysis, Theory of Semigroups, Kato's Conjecture; Functional Differential Equations. Artificial Intelligence and Machine Learning, Pattern Recognition DNA Computing, Reinforcement Learning.

Author of 8 monographs, course books and study guides. Author of scientific papers in peer-reviewed Russian and foreign journals (SCOPUS, Web of Science, journals approved by the State Commission for Academic Degrees and Titles under the Russian Ministry of Education). A regular speaker at Russian and international conferences.

Thirteen-times grantee of the Russian Foundation for Fundamental Research (Russian Foundation for the Humanities), two-times INTAS grantee performing as a supervisor and performer. Acted as a performer in conducting multiple research projects and rendering services to the ministries and agencies of the Russian Federation.



# HEAD OF THE PROGRAMME

Active member of the Russian Academy of Military Sciences, Life-member of European Geosciences Union; Expert at the Russian Academy of Science.

Member of the D 999.058.03 Dissertation Council in Major 08.00.05 Economics and National Economy Management (Innovations Management, Management).

Member of D 999.205.02 Dissertation Council in Majors 08.00.05 Economics and National Economy Management (Economics of an Enterprise, Economics, Organization and Management of Enterprises, Industries and Industrial Complexes) and 08.00.10 Finance, Monetary Circulation and Credit.

Member of D 212.165.10 Dissertation Council in Major 01.02.05 Fluid Mechanics.