

MATHEMATICAL MODELING OF BIOLOGICAL FLUIDS FLOWS

Moscow Institute of Physics and Technology (National Research University)

Degree or qualification is awarded: **PhD (Candidate of Science)**

Language of study: **English**

Mode of study: **full-time**

Duration: **4 years**

Availability of free education: **yes**

Price: **375 000 RUB**

Programme webpage at the university website:

<https://eng.mipt.ru/programs/mathematical-modeling-of-biological-fluids-flows/>

Programme curator: **Denis Ustyuzhaninov**

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Entry requirements:

- Master's degree / equivalent in a related field
- B2 level of English
- Good track record of publications related to the topic of the intended research
- Strong research proposal 1,500 - 3,500 words

Research supervisor:

[Sergey Simakov](#)

PhD

Supervisor's research interests:

The research covers reduced order mathematical modeling of the cardiovascular and respiratory systems, transport and control processes. Applications include the analysis of blood flow in the human body before and after vascular operations on removing stenoses, cardiac function in the presence of pathologies, microcirculation in the presence of tumor angiogenesis, metabolism during intensive physical exercise, etc.

Research highlights:

The research is performed in collaboration with partners from Institute of Numerical Mathematics RAS, Shanghai Jiao Tong University and King's College London. Applied tasks for mathematical modeling are stated in collaboration with medical partners from Sechenov University and Bakulev Scientific Center of Cardiovascular Surgery.

Supervisor's specific requirements:

- Master of science degree in the relevant field.
- Background in numerical methods for partial differential equations.
- Good programming skills (Fortran, C++).

Main publications:

- Y. Vassilevski, M. Olshanskii, S. Simakov, A. Kolobov, A. Danilov, Personalized Computational Hemodynamics: Models, Methods, and Applications for Vascular Surgery and Antitumor Therapy, Academic Press, 2020.
- N. Bessonov, A. Sequiera, S. Simakov, et.al., Methods of Blood Flow Modelling, Mathematical Modelling of Natural Phenomena, 11(1), p.1-25, 2016.
- S.S. Simakov, Modern methods of mathematical modeling of blood flow using reduced order methods, Computer Research and Modeling, 10(5), p.581-604, 2018.

Specializations within this programme