NUMERICAL SIMULATION OF SHOCK AND DETONATION WAVES PROPAGATION IN VARIOUS MEDIA

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/numerical-simulation-of-shock-and-detonation-waves-propagation-in-various-media/

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:
Pavel Utkin
PhD

Supervisor's research interests:
The research focuses on the development of the numerical algorithms for the simulations of flows of chemically reactive media (gaseous or heterogeneous) and its application to the study of the fundamental and practical problems. The examples include the simulation of the shock wave – coal dust layer interaction during the accident in the mine or the initiation of the supersonic combustion (detonation) in the chamber of the novel propulsion system.

Research highlights:
Student gets the practical skills in solving recent CFD problems in the field of compressible flows using high-performance computing.

Supervisor's specific requirements:

- Basic knowledge of continuum mechanics.
- Basic knowledge of numerical methods.
- Basic knowledge of C/C++ programming languages.

Main publications:

- Utkin, P.S. Numerical simulation of shock wave – dense particles cloud interaction using Godunov solver for Baer-Nunziato equations // International Journal of Numerical Methods for Heat & Fluid Flow. – 2019. – V. 29, No. 9. – P. 3225 – 3241. http://dx.doi.org/10.1108/HFF-10-2018-0587
- Lopato, A.I., Utkin, P.S. Numerical study of detonation wave propagation in the variable cross-section channel using unstructured computational grids // Journal of Combustion. – 2018. – V. 2018. – Article ID 3635797. – 8 P. http://dx.doi.org/10.1155/2018/3635797
- Lopato, A.I., Utkin, P.S. Towards second-order algorithm for the pulsating detonation wave modeling in the

shock-attached frame // Combustion Science and Technology. – 2016. – V. 188, No. 11 – 12. – P. 1844 – 1856. http://dx.doi.org/10.1080/00102202.2016.1212570

Specializations within this programme