

The annotation of the bachelor's degree program «Fundamentals of research activities in the field of mechanics and mathematical modelling»

Training direction: 02.03.01 Mechanics and mathematical modelling

Faculty: Mechanical and mathematical

Training form: Full-time education

Duration of the program: 4 years

Language of education: Russian

Program concept

The direction "Mechanics and Mathematical Modeling" is one from the elite areas of training in higher education in Russia. A combination of fundamental training of students in mechanics and mathematics allows to analyze complex dynamic processes in mechanical and hydromechanical systems, optimize and diagnose dynamic systems based on their complex calculation by representative mathematical models. In this approach, the most complete study of dynamical systems should be based on model physical experiments. An usage of unique laboratory equipment in the educational process in the form of wind and shock tubes with a variety of measuring equipment is a significant factor in increasing the efficiency to teach students in such a significant discipline of this direction, as "Mechanics of Fluid, Gas and Plasma".

Program mission

Preparation of bachelors with extensive knowledge in general areas of mathematics and mechanics, in modern computational methods and information technologies, with knowledge and skills focused on mathematical modeling of physical and mechanical processes during the movement of a liquid or gas, as well as in condensed matter at various scale levels using discrete and continuous methods.

Area of professional activity

1. Research activities in the fields of mathematics, mechanics and physics using mathematical methods and computer technologies
2. a development of effective methods for solving problems of natural science, technology, economics and Management
3. a solution of various problems using mathematical modeling processes and objects and software and information support for research and design activity.

Brief description of the program's content

The most significant disciplines are the following: numerical methods, theoretical mechanics, programming technology and computer work, mathematical analysis, algebra, analytical geometry, discrete mathematics, mathematical logic, differential equations, functional analysis, complex analysis, differential geometry, probability theory, partial differential equations, mathematical statistics, biohydrodynamics, fluid dynamics, computational mechanics, mechanics of liquid, gas and plasma, modeling and prediction of catastrophes.

The State final certification is carried out in the form of protection the final qualifying work.

Program resources

The Department of Physical and Computational Mechanics has a teaching laboratory. The laboratory provides training workshops.

The training laboratory has the following experimental facilities:

- subsonic low-turbulence wind tunnel MT-324
- open type supersonic wind tunnel
- the installation for studying radiative heat transfer
- the installation for measuring thermophysical parameters
- chimney for visualization of current lines
- the installation for modeling ground forest fires
- thermal imager Jade J530SB
- drying cabinet ShSP 0.5-30
- electric arc gas heater (plasma torch) EDP-104A.50
- the installation for physical modeling of natural (grassroots forest, steppe and peat) fires and their effect of natural fires on cities, towns and villages (under construction)
- laser Doppler system for measuring the flow velocity of gases and liquids.

The training process uses the resources of the training and computing laboratory, consisting of 3 modern computer classes equipped with electronic boards, projectors, powerful computers equipped with the latest licensed software: Microsoft Windows 10 OS, GNU/Linux SLES 10, GNU/Linux CentOS 6; office and publishing packages Microsoft Office 2010, MikTeX 2.9; application development tools and DBMS Microsoft Visual Studio 2010, Delphi 2006 (for working with databases - Borland Database Engine, Database Desktop), Lazarus, Borland Pascal, PascalABC.NET, Intel Fortran Compiler 12, CUDA Toolkit 4; mathematical packages PTC Mathcad 13.15, Mathematica 8, Maple 15, Matlab R2011b; packages of mathematical and graphic data processing Golden Software Grapher, Golden Software Surfer; packages for solving computational fluid dynamics problems Ansys CFD 14, Fluent Flowlab. In addition, the training uses the resources of the TSU supercomputer center and a computing cluster of TSU «Cyberia» with a performance of 100 Teraflops.

At present TSU has a high quality and continuous developing teaching personnel in mathematics, mathematical modeling and computer science. There are a number of recognized authoritative scientific and pedagogical schools, which carry out educational and scientific activities at the world level:

1. School of Mathematical Analysis (Department of Mathematical Analysis and Function theory of Mechanical and mathematical faculty, Candidate of Physical and Mathematical Sciences, Kolesnikov I.S.)
2. School of Algebra (Department of Algebra of Mechanical and mathematical faculty, professor Krylov P.A.)

3. School of Functional Analysis (Department of Mathematical Analysis and Function theory of Mechanical and mathematical faculty, professor Gulko S.P.)
4. School of probabilistic and statistical methods and their applications (Chair of Mathematical Analysis of Mechanical and mathematical faculty, TSU - University of Rouen (France), Federal Professor of Mathematics, professor Pergamenschikov S.M.)
5. School of Engineering Mechanics and Thermal Physics (Department of Theoretical mechanics MMF, prof. Sheremet M.A.)

Prospects for employment, professional and scientific activities

Graduates of the program have the possibility of employment in partner organizations of the Mechanical and mathematical faculty or to continue education within the framework of training in master's and postgraduate studies:

1. Master's and postgraduate study of TSU
2. Company "SIAM" (Tomsk) - mathematical modeling of transportation problems and oil and gas production
3. Tomsklab LLC (Tomsk) - development of mathematical methods and software for image recognition
4. Research Institute for Monitoring Climatic and Environmental systems (the Tomsk Science Center of Siberian Branch of Russian Academy of Sciences) – development of mathematical models in subject areas
5. Research Institute of Atmospheric Optics (the Tomsk Science Center of Siberian Branch of Russian Academy of Sciences) – development of mathematical models in subject areas
6. Company Econophysica LTD (Tomsk, Moscow, London) – mathematical modeling of financial activity

Admission conditions

Minimal scores: abiturient.tsu.ru/

Entrance tests: abiturient.tsu.ru/

Documents for admission: abiturient.tsu.ru/

Program leader:

Genze Leonid Vladimirovich,

Ph.D. of Phys. and Math. Sciences, Associate Professor,

<mailto:dean@math.tsu.ru>, 529740

Location address:

634050, Russia, Tomsk, Lenin's avenue, Tomsk State University, Mechanical and mathematical faculty, 2-nd learning campus, room 417 (dean's office)

Link to the page of the educational program on the website of the university/faculty/institute:

<http://www.math.tsu.ru/node/785>