

Ministry of Science and Higher Education of the Russian Federation  
NATIONAL RESEARCH  
TOMSK STATE UNIVERSITY (NR TSU)

Institute of Applied Mathematics and Computer Science

APPROVE:   
Director

A. V. Zamyatin

Work program of the discipline

**Adaptive Math Training**

in the major of training

**01.04.02 Applied mathematics and informatics**

Orientation (profile) of training:

**Big Data and Data Science**

Form of study  
**full-time**

Qualification  
**Master**

Year of admission  
**2023**

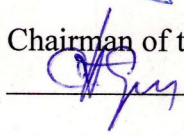
Code of discipline in the curriculum: FTD.01

AGREED:

Head of EP

  
A.V. Zamyatin

Chairman of the EMC

  
S.P. Sushchenko

Tomsk – 2023

### **1. Purpose and planned results of mastering the discipline**

The purpose of mastering the discipline is the formation of the following competencies:  
- GPC-1 - the ability to solve actual problems of fundamental and applied mathematics.  
The results of mastering the discipline are the following indicators of the achievement of competencies:

IOPC-1.1 Analyzes problems in the field of fundamental and applied mathematics.

IOPC-1.3 Solves actual problems of fundamental and applied mathematics.

### **2. Tasks of mastering the discipline**

- Learn the apparatus of elementary mathematics, necessary for the development of disciplines

- Learn to apply the methods of elementary mathematics

- Master the methods necessary for the development of mathematical courses of the 1st and 2nd year of study at the university.

### **3. The place of discipline in the structure of the educational program**

The discipline belongs to the optional part of the educational program

### **4. Semester of mastering and form of intermediate certification in the discipline**

First semester, credit.

### **5. Entrance requirements for mastering the discipline**

For the successful mastering of the discipline, competencies are required that are formed in the course of mastering the program of a secondary school.

### **6. Implementation language**

English.

### **7. Scope of discipline**

The total labor intensity of the discipline is 2 credits, 72 hours, of which:

- lectures: 16 hours

- laboratory: 16 hours

including practical training: 0 h.

The volume of independent work of the student is determined by the curriculum.

### **8. The content of the discipline, structured by topics**

Section 1. Transformation of algebraic expressions (introductory lecture Power properties, factoring, working with fractional rational and irrational expressions

Section 2 Rational equations and inequalities Solving linear, quadratic, cubic equations and inequalities, equations with modulus, solving fractional rational equations and inequalities

Section 3 Irrational equations and inequalities Solving irrational equations and inequalities

Section 4 Trigonometry Solution of trigonometric equations and inequalities, transformation of trigonometric expressions by applying the formulas of reduction of degree, double angle, basic trigonometric identity and consequences.

Section 5 Logarithms Solving logarithmic and exponential equations and inequalities, transforming logarithmic and exponential expressions using the properties of the logarithm and powers.

Section 6 Functions Elementary functions and their properties, offset relative to the abscissa and ordinate axis, compression / expansion, symmetrical display, construction of a sketch of a function graph.

### **9. Ongoing evaluation**

The current control of the discipline is carried out taking into account the specifics of the implementation of the discipline.

The discipline is implemented in a mixed format using the Plario online adaptive learning platform, which is integrated with TSU Moodle. It is a pull-up (leveling) course intended for students, undergraduates, graduate students, teachers of TSU, who need knowledge of basic mathematics in their educational or professional activities.

The student enters Plario through a personal Moodle account. In the Moodle system, the course teacher has the ability to track individual trajectories for each section, the degree of mastery of skills, control the amount of time spent in the system, the amount of material covered for each section. Once a week, the teacher conducts consultations in person, and there is also the possibility of online consultations in the Moodle system.

The form of attestation is a test. The offset is given if

1) for each section, the student showed mastery of skills at least 80 percent. The Plario system records the mastery of skills for each section automatically.

2) The test is written with at least “good”

Typical control tasks or other materials necessary for assessing learning outcomes that characterize the stages of competency formation, and methodological materials that determine the procedures for assessing learning outcomes, are given in the Evaluation Tools for the discipline.

### **10. The procedure for conducting and criteria for evaluating the intermediate certification**

The form of attestation is a test. The offset is given if

1) for each section, the student showed mastery of skills at least 80 percent. The Plario system records the development of skills for each section in automatic mode - the formation of IOTC 1.1

2) The test is written with at least “good”

Typical control tasks or other materials necessary for assessing learning outcomes that characterize the stages of competency formation, and methodological materials that determine the procedures for assessing learning outcomes, are given in the Evaluation Tools for the discipline.

Typical control tasks or other materials necessary for the current certification, and methodological materials that determine the procedures for evaluating the results of the current certification, are given in the Evaluation Tools for the discipline.

### **11. Educational and methodological support**

a) An electronic training course in the discipline at the electronic university "Moodle"

b) Evaluation materials of the current control and intermediate certification for the discipline are in the Evaluation tools of the discipline.

c) Plan of seminars / practical classes according to the curriculum.

e) To master the educational results of the discipline, it is necessary to complete 6 sections of the adaptive course. The mixed format of the discipline and adaptive technology

(algorithmic), which is the basis of the course, allows you to pass the discipline at a pace convenient for the student using any device. It is necessary to follow the sequence of sections recommended by the teacher.

For the successful mastering of the discipline, regular classes in each section are necessary. Before studying each section, it is necessary to pass an input diagnostic test in the system, according to the results of which a digital twin (profile) of the student is formed and the level of proficiency in each skill is determined. The time spent in the system will depend on the results of the entrance test. Further, the system itself offers training exercises and theoretical material, forms an individual trajectory in real time, which is available to the student and the teacher. Lessons in the system are recommended as asynchronous lessons in remote mode (controlled by the SIW).

Practical classroom lessons can take place both in the classical form and in the format of consultations. 1.

## **12. List of educational literature and Internet resources**

a) main literature:

1. Mordkovich A.G. Algebra and the beginning of mathematical analysis 10-11 cells. Part 1 / A.G. Mordkovich. – Moscow, 2013 – 224 p.

2. Kolmogorov A.N. Algebra, 10-11 cells, Ch1-Ch2 / A.N. Kolmogorov. - Enlightenment, 2018 - 400 p.

b) additional literature:

1. Kulanin E.D. 3000 competitive tasks in mathematics / E.D. Kulanin [and others] - Publisher: Iris-Press, 2008 - 624 p.

## **13. List of information technologies**

a) licensed and freely distributed software:

– Microsoft Office Standard 2013 Russian: software package. Includes applications: MS Office Word, MS Office Excel, MS Office PowerPoint, MS Office OneNote, MS Office Publisher, MS Outlook, MS Office Web Apps (Word Excel MS PowerPoint Outlook);  
- publicly available cloud technologies (Google Docs, Yandex disk, etc.).

b) information reference systems:

– Electronic catalog of the TSU Scientific Library – <http://chamo.lib.tsu.ru/search/query?locale=ru&theme=system>  
– TSU electronic library (repository) – <http://vital.lib.tsu.ru/vital/access/manager/Index>  
– EBS Lan – <http://e.lanbook.com/>  
– EBS Student Advisor – <http://www.studentlibrary.ru/>  
– Urayt educational platform – <https://urait.ru/>  
– EBS ZNANIUM.com – <https://znanium.com/>  
- EBS IPRbooks - <http://www.iprbookshop.ru/>

## **14. Logistics**

Audiences for conducting lecture-type classes (for an introductory lecture and conducting tests).

## **15. Authors information**

Dammer Diana Damirovna, Candidate of Physical and Mathematical Sciences, Associate Professor, Associate Professor of the Department of Probability Theory and Mathematical Statistics, National Research Tomsk State University.