

Navoi State University – Applied Mathematics

Program Duration: 2 years

Mode of Study: Full-time

Program Code: 70540201

Total Workload: 120 ECTS credits

ECTS credits per semester: 30

Overview

The Master's degree program in **Applied Mathematics** (Program Code: 70540201) at Navoi State University is a two-year, full-time academic program comprising a total workload of 120 ECTS credits (30 ECTS per semester). The program is designed to prepare highly qualified applied mathematicians, data analysts, mathematical modelers, numerical analysts, and scientific researchers equipped with advanced knowledge in mathematical physics, differential equations, optimization methods, scientific computing, and algorithmic data modeling.

The curriculum integrates advanced theoretical mathematics, scientific programming, numerical simulations, and real-world problem-solving techniques. Students gain expertise in mathematical modeling of natural, physical, economic, and technological systems, high-performance computing, machine learning algorithms, and numerical methods for differential equations. The program places strong emphasis on practical research applications, technological innovation, industrial process optimization, and regional industrial and environmental modeling challenges in Uzbekistan.

Graduates of this program are fully equipped to pursue careers as mathematical modelers, data scientists, quantitative analysts, software developers, research officers in scientific institutes, and academic staff in higher education institutions, as well as to continue their studies at the doctoral (PhD) level.

Assessment

A comprehensive and multi-component assessment system is applied in the Master's program in Applied Mathematics to ensure continuous learning, mathematical precision, computational competence, and scientific rigor.

1. Course-based assessment

- **Presentations and seminars** – assess students' ability to analyze, present, and defend mathematical proofs, numerical algorithms, scientific computing models, and research paper reviews in academic settings.
- **Mini-tests, quizzes, and oral exams** – monitor understanding of core theoretical concepts, partial differential equations, optimization techniques, functional analysis, and numerical stability.

- **Midterm and final examinations** – evaluate mathematical rigor, problem-solving skills, and algorithm design through written examinations and computational lab tests.
 - **Portfolio assignments** – compile scientific programming scripts, numerical simulation reports, mathematical modeling code, and research paper drafts demonstrating progressive skill development.
 - **Independent assignments** – encourage independent mathematical research, algorithm optimization, numerical data modeling, and theoretical problem-solving tasks.
2. **Research-based assessment**
- **Scientific Research Work (ITI)** – evaluated through research proposals, mathematical model verifications, progress reports, and defense of research outcomes before the department.
 - **Scientific and Pedagogical Work (IPI)** – evaluated via teaching practice, preparation of practical mathematical problem sets, lab manuals, and academic reporting.
 - **Master’s Thesis (MD/M)** – evaluated based on scientific originality, mathematical correctness, computational implementation, thesis writing quality, and public defense before the State Attestation Commission.
3. **Practice-based assessment**
- **Industrial and Laboratory Practice** – evaluated through performance in IT enterprises, research institutes, industrial analytics centers, and financial modeling departments, accompanied by comprehensive practice reports.
 - **Pre-graduation practice** – assessed on the integration of theoretical/computational results, algorithm testing, and final thesis preparation.
4. **Work-integrated learning**
- **Computational & Modeling Projects** – assessed on mathematical formulation, algorithmic efficiency, code accuracy, and practical applicability to engineering or scientific problems.

Academic Requirements

Admission Requirements-Applicants applying for the Master’s degree program in Applied Mathematics (Code: 70540201) must satisfy the following criteria:

- **Educational background** – A Bachelor’s degree (or equivalent qualification) in applied mathematics, mathematics, computer science, informatics, engineering physics, or related quantitative fields from a recognized higher education institution.
- **Academic excellence** – Applicants holding an honors diploma (*imtiyozli diplom*) are eligible for preferential admission according to current regulations of the Ministry of Higher Education, Science and Innovation of the Republic of Uzbekistan.
- **Language proficiency** – A valid national or international certificate demonstrating at least B2-level foreign language proficiency (CEFR, IELTS, TOEFL, etc.) in English, Russian, or another recognized foreign language.

Graduation Requirements

To be granted the Master of Science degree in Applied Mathematics, students are required to:

- Complete all compulsory and elective modules specified in the curriculum, accumulating a total of **120 ECTS credits** (30 ECTS per semester).

- Maintain standard academic standing according to Navoi State University regulations (passing marks in all subjects).
- Successfully complete all practical trainings (computational research practice, educational teaching practice, and pre-graduation practice) with positive performance evaluations.
- Fulfill all research requirements (Scientific Research Work and Scientific-Pedagogical Work).
- Prepare, submit, and successfully defend a **Master's Thesis** demonstrating independent mathematical research and algorithmic execution before the State Attestation Commission.
- Pass all required state attestation processes.

Courses Offered

Year 1

Compulsory:

- Advanced Mathematical Modeling and Simulation Methods
- Reforms in the Education System under the Development Strategy of New Uzbekistan
- Partial Differential Equations and Equations of Mathematical Physics
- Modern Numerical Methods and Scientific Computing
- Functional Analysis and Operator Theory in Applied Problems

Elective:

- Optimization Techniques and Operations Research
- Mathematical Methods in Data Science and Machine Learning
- Parallel and High-Performance Computing (C++, Python, MATLAB)
- Stochastic Processes and Probability Theory
- Regulatory Documents and Quality Standards in Mathematical Education and Research

Year 2

Compulsory:

- Inverse and Ill-Posed Problems of Mathematical Physics
- Computational Fluid Dynamics and Continuum Mechanics Modeling
- Mathematical Methods in Finance and Economics

Elective:

- Dynamical Systems and Chaos Theory
- Mathematical Biology and Bio-modeling
- Control Theory and Optimal Control
- Professional Morality and Ethics in Science
- Matrix Analysis and Computational Linear Algebra
- Graph Theory and Network Algorithms
- Cryptography and Mathematical Cybersecurity

Career Opportunities

Graduates of the Master's degree program in Applied Mathematics acquire strong quantitative, analytical, and programming capabilities, enabling them to pursue careers across tech, industrial, financial, research, and educational sectors:

- **Mathematical Modeler / Scientific Computing Specialist** in research institutes under the Academy of Sciences of the Republic of Uzbekistan (e.g., Institute of Mathematics, V.I.Romanovskiy Institute).
- **Data Scientist / Data Analyst / Quantitative Analyst** in technology companies, banking institutions, insurance firms, and fintech enterprises.
- **Applied Mathematics Lecturer / Instructor** in higher education institutions, specialized academic lyceums, professional colleges, and IT academies.
- **Algorithm Engineer / Software Developer** specializing in computational software, simulation tools, graphics engines, and artificial intelligence systems.
- **R&D Specialist / Systems Analyst** in industrial plants, mining and metallurgical combines (e.g., NGMK, AGMK), energy companies, and telecommunications corporations.
- **Operations Research / Logistics Analyst** in supply chain management companies, transportation agencies, and manufacturing enterprises.
- **Economic & Financial Modeler** in the Ministry of Economy and Finance, central bank departments, and risk assessment agencies.
- **Consultant in Quantitative Analytics** providing freelance or corporate advisory services in statistical modeling, algorithm optimization, and big data processing.

Tuition Fees

- **For local students:** Approximate annual tuition – 9,700,000 UZS.
- **For international students:** Approximate annual tuition – 774.28 USD.

(Note: Tuition fees are subject to adjustment in accordance with university policy and foreign currency exchange rates.)

Learning Outcomes

Master's Degree in Applied Mathematics

Upon successful completion of the program, graduates will be able to:

1. Knowledge

- **1.1.** Demonstrate advanced knowledge of theoretical mathematics, differential equations, functional analysis, probability theory, and numerical analysis.
- **1.2.** Understand the principles of mathematical modeling for complex physical, biological, economic, and technological processes.
- **1.3.** Explain state-of-the-art numerical methods, optimization algorithms, machine learning models, and computational linear algebra techniques.
- **1.4.** Demonstrate knowledge of high-performance computing architectures, parallel programming languages (Python, C++, MATLAB, R), and mathematical software frameworks.
- **1.5.** Recognize the application of mathematical methods in solving real-world technological, industrial, financial, and environmental challenges.

2. Skills

- **2.1.** Formulate precise mathematical models representing physical phenomena, engineering structures, economic trends, and industrial workflows.
- **2.2.** Design, implement, and analyze efficient numerical algorithms, testing their stability, convergence, and computational complexity.
- **2.3.** Write, debug, and optimize scientific computing programs using modern computational tools and high-performance programming languages.
- **2.4.** Apply statistical, machine learning, and data analytics methods to analyze large quantitative datasets and make predictive evaluations.
- **2.5.** Prepare rigorous scientific reports, mathematical proofs, computational algorithms, technical documentations, and publishable research papers.
- **2.6.** Effectively present complex mathematical models, algorithmic solutions, and data-driven findings to interdisciplinary research teams, engineers, and students in national and foreign languages.

3. Competences

- **3.1. Mathematical & Research Competence** – Conduct independent, scientifically rigorous, and original research in applied mathematics to solve complex theoretical and practical problems.
- **3.2. Computational & Engineering Competence** – Develop and maintain high-precision computational software, mathematical simulation tools, and quantitative data pipelines.
- **3.3. Methodological & Educational Competence** – Teach mathematical and computational disciplines at academic institutions, designing up-to-date lecture materials and practical programming labs.
- **3.4. Analytical Leadership Competence** – Direct quantitative research teams, data analysis projects, and mathematical modeling campaigns in corporate and scientific settings.
- **3.5. Professional Ethics & Rigor** – Uphold high standards of mathematical accuracy, scientific integrity, objective data representation, and algorithmic fairness.
- **3.6. Lifelong Learning Competence** – Continuously adopt new mathematical theories, emerging programming paradigms, and quantitative techniques through ongoing research and international scientific collaborations.