Approved by
Decision № 02-01/02 of the Academic Board of Saint Tbel Abuseridze Teaching University

of Patriarchate of Georgia

Decision No 02-01/04 of the Academic Council 08.02.2019

Academic Board Chairperson,

Rector, Skhalta Archbishop Spiridon

Reviewed by
the Council of the Faculty of Agricultural Sciences and Business Administration

Protocol № 02-04-06 / 01. 02.02.2019

Saint Tbel Abuserisdze
Teaching University of Patriarchate of Georgia
Agricultural Sciences and Business Administration
Faculty

Master's educational program

Mathematics

Qualification/academic degree: ***Master of Mathematics***
QUALIFICATION/ACADEMIC DEGREE – MASTER OF MATHEMATICS

Volume of the program: **120 ECTS**

The head of program
Associate Professor: Givi Chumburidze

Khichauri, 2019

Title of the educational program: Mathematics

Education level:
The second cycle of higher education- Master's studies

Qualification/academic degree to be awarded: Master of Mathematics

Volume of the program: The program consists of 120 ECTS credits. 75 credits are allocated for the mandatory components of the specialty (including the elective module - 20 credits). 15 credits are for free component subjects, while 30 credits are for the Master's thesis.

Language of instruction: The program will be implemented in Georgian

Prerequisite for admission to the Master's program: Bachelor's academic degree. Persons who meet the requirements of the unified national MA exams may be admitted to the Master's program. In the case of competition, priority is given to the results of logical and quantitative reasoning at the unified national MA exams.

The Program Goal and Objectives

Classic and modern methods of mathematics play significant role in research of fundamental and applied fields of science. Their number as well as applied significance is systematically increasing in development of natural sciences and engineering-technological directions. The program is also important due to the increased demand on the teachers of mathematics, especially in the regions, including mountainous Adjara.

The goal of the Master's program in mathematics:

To give the Master's students, deep, comprehensive and systemic knowledge of fundamental directions of mathematics, which gives them an ability to develop and use original ideas while researching problems;

- ✓ To ensure that students develop skills of using mathematical methods in scientific research and for the purposes of solving various practical problems.
- ✓ To ensure satisfaction of the aspirations of MA students who are interested in receiving diverse and wide knowledge, by offering them elective modules in various directions of mathematics;
- ✓ To make sure that Master's students develop such skills, which can be used in order to develop the latest methods and ways for understanding, analyzing, evaluating and solving the theoretical and/or practical problems arising in various fields of science, technology and economics.
- ✓ To make sure that students develop skills of introducing their own opinions, argumentations, research methods and results to the academic and scientific community by using modern communication technological achievements.

The graduates will be able to work at the higher and secondary educational, scientific, financial, economic, social and statistical institutions. Also at various types of state, non-governmental and private bodies and/or continue their studies and scientific activities on the next level (doctoral studies).

The structure of the program

The educational program consists of 120 credits, 75 of them are allocated to the mandatory academic components of the specialty. 30 credits are for research component and 15 credits are for elective courses of the specialty.

Mandatory components (75 credits) envisage elective modules. Volume of each module is 20 credits. These modules are selected by a student from the second semester of the studies.

The MA program envisages completion of MA thesis, in the selected specialty (according to the particularly selected module), which consists of 30 credits. Completion of the MA thesis means preparation of scientific-research paper and its introduction to the public defense. Master's student may be admitted to the defense of MA thesis only after completing the academic components envisaged by the program.

Learning outcomes

General (transfer) competencies	Field competencies
Knowledge and understanding	
The graduate will have a deep and systematic knowledge of the field that gives the possibility to develop new, original ideas, to understand the ways of solving individual problems.	Has knowledge in various directions of mathematics: mathematical analysis, algebra, analytic geometry, functions theory, probability theory, deep and comprehensive knowledge of fundamentals of optimization theory and practical issues: has an ability to understand theoretical problems of mathematics, its foundations, principles of composition and main methods of research of mathematics.
The ability to apply knowledge in practice	
Is able to act in a new, unforeseen and multidisciplinary environment; search for new, original ways for solving complex problems, including carrying out independent studies using the latest methods and approaches	Is able to do mathematical analysis of multiple variables, to compose strict proof of the main provisions of the higher algebra, analytic geometry, function theory, probability theory, optimization and to use proper methods while researching the problem and solving the practical tasks: has an ability to elaborate the methods for solving the problems and to analyze the received results based on the analysis and examination of the characteristics of solutions. Is able to use analytical or/and quantitative methods to solve a problem.
Making Judgment	
Is able to formulate substantiated conclusions based on critical analysis of complex and incomplete information (including recent researches); innovative synthesis of information based on the latest data.	Has an ability to compose and develop logical mathematical reasoning, to elaborate the givens, assumptions and opinions clearly. Is able to study and analyze specific issues related to particular mathematical problems; has an ability to discuss and generate right opinion from the reasoning. Is able to elaborate and prove the mathematical propositions, to study mathematical theory of the respective complexity and to analyze the obtained results.
Communication skills	
Is able to communicate their conclusions, arguments and research methods to the academic or professional audience in Georgian and foreign languages, taking into account the achievements of information-communication technologies.	Students have ability to: elaborate main issues of mathematical theory clearly, to prepare scientific work on the obtained results and do the speech. ✓ Comprehensive understanding of various directions and fields of mathematics, to elaborate and deliver them in a clear manner to the audience by using proper resources.
Learning Skills	

MA students have an ability to study independently, understand the peculiarities of the academic process and high level of strategic planning.	Is able ✓ To determine independently the list of issues that are interesting and necessary for him/her from the various directions of mathematics, to deepen the respective knowledge on a level, which is necessary to continue the studies on the next level of higher education or/and to conduct a scientific research. ✓ evaluate the knowledge and achieved skills results and plans the ways and activities in order to improve them.
Values	
Evaluation of one's own and others' attitudes towards the values and making a contribution to the introduction of new values.	Understands significance of classic and modern fields of mathematics for scientific work and their use-values. Participates in scientific, practical and teaching activities, in the process of establishing the significance and role of mathematics in cultural, social and economic development of society. Aspires to establishment of harmonization of natural environment and life, including by using the achievements of mathematics; also works to protect international cultural heritage and national traditions.

Learning outcomes achievement methods

The following methods will be applied during the implementation of the program:

Theoretical materials are delivered during the lecture by the method of explanation, which is based on the discussion on the given issue. Consolidation of the studied theoretical materials is done via setting and solving the practical tasks. According to the characteristics of the material, the study process may be carried out from a particular subject to general or from general to particular. In order to develop practical skills and strengthen the knowledge, the problem based learning method is used during group works, which means setting a problem derived from a particular practice and solving it by using the theoretical material. Also, while developing the skills of independent work, it is appropriate to use homework and library-research paper, while a group project is used to develop the skills of group work and communication.

While teaching the academic courses included in the program, the following methods may be also used:

Explanation - this includes verbal delivery of the materials via lecture, speaking, and demonstration. It is based on the reasoning on the given subject.

Reprocessing method - means to solve the sample tasks, to repeat the test, the process of proving a theorem.

Problem oriented approach via setting, understanding and solving the respective problem.

During heuristic-research approach, the ways of solving the theoretical problems are being searched and analyzed by active participation of students.

The Case Study - The professor discusses particular cases during a lecture together with students. Analysis of these cases facilitates comprehensive study of the issue.

Student's knowledge evaluation system

Credits can be obtained by the student for the educational component only after achieving learning outcomes envisaged by the syllabus which is expressed by one of the positive assessment presented by the credit system.

The evaluation of the results achieved by students considers the following:

a) Midterm evaluation, which, in turn, includes evaluation of the student's independent work, daily activity and current grades. Midterm evaluation may also include other components;

b) Final exam evaluation.

Maximum grade for the course/module is 100 points, where 40 points are allocated for the final examination, while 60 points are allocated for the midterm evaluation.

Homework or/and library-research papers are the main means used to evaluate an independent work in mathematical disciplines. During the ongoing ranking evaluation, it is a written work, which includes theoretical materials, definitions, concepts and practical problems that can be evaluated as knowledge as well as a skill of applying the knowledge in practice. Final examination may be carried out in a written as well as in a verbal format.

There are five types of positive and two types of negative evaluation.

Positive evaluations:

a) (A) Excellent - 91% or more of maximum grade;

b) (B) Very good - 81% 90% of maximum grade;

c) (C) Good - 71% 80% of maximum grade;

d) (D) Satisfactory - 61% -70% of maximum grade;

e) (E) Sufficient- 51% -60% of maximum grade.

Negative evaluation are:

a) (FX) - Did not pass - 41-50% of maximum evaluation, which means that it is required for the student to work more to pass the examination and he/she is given one opportunity to pass an additional examination by means of an independent work.

b) (F-0) Fail – 40 and less of maximum point, which means that the work carried out by the student is not enough and he/she has to retake the course.

The student also gets evaluation "Fail":

a) if he/she was not admitted to the final examination;

b) failed on the final or the additional examination.

The particular criteria for evaluation are determined by the syllabus of the appropriate course.

The following Criteria is used to evaluate a Master's thesis:

a. Knowledge of the field - 20 points;

b. Relevance of the research/problem and scientific value of the obtained results - 20 points;

c. Complex analysis of the issue - 10 points;

d. Relation of the set problem (research topic) with other fields of mathematics - 10 points;

e. Originality of the research - 10 points;

f. practical importance of the research results - 10 points.

g. Academic level of the paper - 10 points;

h. Evaluation of the presentation - 10 points.

Structure of the Curriculum

	Title of the academic courses	Number of Credits	Number of hours	Distribution of hours							Alignment of the number of credits with Semester distribution			
				Lecture	Laboratory session	Practical/Practice	Work in group	Midterm examination	Final examination	Independent work	I	II	III	IV
	Mandatory academic courses	**50**									**25**	**25**		
1	Mathematical logic	5	125	15		14		1	3	92	5			
2	Set theory	5	125	15		14		1	3	92	5			
3	Mathematical analysis of multiple variables	5	125	15		14		1	3	92	5			
4	General algebra	5	125	15		14		1	3	92	5			
5	Fundamentals of Geometry	5	125	15		14		1	3	92		5		
6	Complex analysis	5	125	15		14		1	3	92		5		
7	The probability theory and its use	5	125	15		14		1	3	92	5			
8	Applied mathematical statistics	5	125	15		14		1	3	92		5		
9	Discrete Mathematics	5	125	15		14		1	3	92		5		
10	Optimization	5	125	15		14		1	3	92		5		
11	**Elective modules of the specialty**	**20**										**5**	**15**	
11–A	**Geometry and Topology**	**20**												
11A1	Affine geometry	5	125	15		14		1	3	92				
11A2	Projective geometry	5	125	15		14		1	3	92				
11A3	Topological spaces	5	125	15		14		1	3	92				
11A4	Geometry and Topology	5	125	15		14		1	3	92				
11–B	**Mathematical logic, algebra and the number theory**	**20**												
11B1	Non-classical logic	5	125	15		14		1	3	92				
11B2	Analytic number theory	5	125	15		14		1	3	92				
11B3	General Group Theory	5	125	15		14		1	3	92				
11B4	Homological algebra	5	125	15		14		1	3	92				
11–C	**Mathematical analysis and the probability theory**	**20**												
11C1	Size theory	5	125	15		14		1	3	92				
11C2	General theory of accidental processes	5	125	15		14		1	3	92				
11C3	General theory of mathematical statistics	5	125	15		14		1	3	92				
11C4	Functions of bounded variation	5	125	15		14		1	3	92				

11–D	**Optimization and mathematical modules of management**	**20**												
11D1	Multidimensional Optimization	5	125	15		14		1	3	92				
11D2	Mathematical models of management	5	125	15		14		1	3	92				
11D3	Optimal management	5	125	15		14		1	3	92				
11D4	Optimal algorithms	5	125	15		14		1	3	92				
11–E	**Fundamentals of elementary mathematics.**	**20**												
11E1	Fundamentals of elementary mathematics. Algebra	5	125	20		10			3	92				
11E2	Fundamentals of elementary mathematics. Geometry	5	125	20		10			3	92				
11E3	Fundamentals of elementary mathematics. Arithmetic	5	125	20		10			3	92				
11E4	Fundamentals of elementary mathematics. Probability Theory	5	125	20		10			3	92				
	Elective courses of foreign language	**5**									**5**			
12	Russian language	5	125			13	15	2	3	92				
13	English language	5	125			28		2	3	92				
	Elective courses of the specialty	15											15	
14	Applied mathematics	5	125	15		14		1	3	92				
15	History of Mathematics	5	125	15		14		1	3	92				
16	Nonlinear analysis	5	125	15		14		1	3	92				
17	Mathematical physics	5	125	15		14		1	3	92				
18	Differential equations in banach spaces	5	125	15		14		1	3	92				
19	Fourier series	5	125	15		14		1	3	92				
20	Abstract harmonic analysis	5	125	15		14		1	3	92				
21	Special parts of topology	5	125	15		14		1	3	92				
	Master's thesis	**30**	**750**											**30**
	Total sum	**120**									**30**	**30**	**30**	**30**

Map of Learning Outcomes							
Educational courses		Field Components					
		Knowledge and understanding	Ability to apply nowledge in practice	Making judgment	Communication skills	Learning Skills	Values
	Mandatory academic courses						
1	Mathematical logic	+	+	+	+	+	+
2	Set theory	+	+	+			+
3	Mathematical analysis of multiple variables	+	+	+			
4	General algebra	+	+	+			
5	Fundamentals of Geometry	+	+	+			
6	Complex analysis	+	+				
7	The probability theory and its use	+	+			+	+
8	Applied mathematical statistics	+	+	+		+	
9	Discrete mathematics	+	+	+	+		+
10	optimization	+	+	+	+	+	+
11	**Elective modules of the specialty**						
11–A	**Geometry and Topology**						
11A 1	Affine geometry	+	+	+			
11A 2	Projective geometry	+	+	+			
11A 3	Topological spaces	+	+	+			
11A 4	Geometry and Topology	+	+	+			
11–B	**Mathematical logic, algebra and the number theory**						
11B 1	Non-classical logic	+	+	+	+	+	+
11B 2	Analytic number theory	+	+				
11B 3	General Group Theory	+	+	+			+
11B 4	Homological algebra	+	+				
11–C	**Mathematical analysis and the probability theory**						
11C 1	Size theory	+	+	+			
11C 2	General theory of accidental processes	+	+				
11C 3	General theory of mathematical statistics	+	+				
11C 4	Functions of bounded variation	+	+				
11–D	**Optimization and mathematical models of management**						

11D 1	Multidimensional Optimization	+	+				
11D 2	Mathematical models of management	+	+			+	
11D 3	Optimal management	+	+				
11D 4	Optimal algorithms	+	+				
11–E	**Fundamentals of elementary mathematics.**						
11E 1	Fundamentals of elementary mathematics. Algebra	+	+	+			
11E 2	Fundamentals of elementary mathematics. Geometry	+	+	+			
11E 3	Fundamentals of elementary mathematics. Arithmetic	+	+	+			
11E 4	Fundamentals of elementary mathematics. Probability Theory	+	+	+			
	The university elective courses						
12	Russian language	+	+	+	+		
13	English language	+	+	+	+		
	Elective courses						
14	Applied mathematics	+	+				
15	History of Mathematics	+	+				+
16	Nonlinear analysis	+	+			+	
17	Mathematical physics	+	+				
18	Differential equations in Banach spaces	+	+				
19	Fourier series	+	+				
20	Abstract harmonic analysis	+	+				
21	Special parts of topology	+	+				

Human and Material Resources

MA program of mathematics is equipped with teaching-computer classes. The university has teaching and scientific literature as a book fund and electronic versions, necessary for studying the courses envisaged by the program. The infrastructure and technical equipment of the institution ensures achievement of learning outcomes envisaged by the educational program of mathematics. The lecture halls are equipped with the inventory necessary for the study process

Human resources that participate in the implementation of the MA program:

1. **Davit Zarnadz**e - Doctor of Physical and Mathematical Sciences, a professor.
2. **Givi Tchumburidze -** Doctor of Physical and Mathematical Sciences, an associate professor.
3. **Giuli Tavdgiridze** - Doctor of Physical and Mathematical Sciences, an associate professor.
4. **Nino Tsinaridze** - Doctor of Physical and Mathematical Sciences, invited lecturer.
5. **Iveri Mukutadze** - Invited Lecturer.
6. **Jumber Abashidze** - Invited lecturer.
7. **Tamila Churkveidze** - visiting lecturer.
8. **Sulkhan Aleksaia-** Academic Doctor of History, an associate professor.
9. **Eter Diasamidze** - Doctor of Philology, a professor.
10. **Nona Shushanide** - Professor, Academic Doctor of History and Theory of Arts;
11. **Natela Beridze**- Academic Doctor of Social Sciences, Professor

Maximum contingent of students to be accepted for the program: Based on the material-technical base, Master's educational program in Mathematics envisages admission of 20 students annually.

Precondition table	
Mandatory academic courses	**Prerequisites**
Mathematical logic	No Prerequisite
Set theory	No Prerequisite
Mathematical analysis of multiple variables	No Prerequisite
General algebra	No Prerequisite
Fundamentals of Geometry	General algebra
Complex analysis	Mathematical analysis of multiple variables
The probability theory and its use	No Prerequisite
Applied mathematical statistics	The probability theory and its use
Discrete mathematics	Mathematical analysis of multiple variables
personnel	Mathematical analysis of multiple variables
Elective modules of the specialty	
Geometry and Topology	
Affine geometry	Fundamentals of Geometry
Projective geometry	Fundamentals of Geometry
Topological spaces	Mathematical analysis of multiple variables
Geometry and Topology	Fundamentals of Geometry
Mathematical logic, algebra and the number theory	
Non-classical logic	Mathematical logic
Analytic number theory	General algebra
General Group Theory	Mathematical logic
Tensor algebra	General algebra
Mathematical analysis and the probability theory	General algebra, General algebra
Size theory	Mathematical analysis of multiple variables
General theory of accidental processes	Set theory
General theory of mathematical statistics	The probability theory and its use
Functions of bounded variation	Mathematical analysis of multiple variables
Optimization and mathematical models of management	None
Multidimensional Optimization	Mathematical analysis of multiple variables
Mathematical models of management	Set theory
Optimal management	Multidimensional Optimization
Optimal algorithms	None
Fundamentals of elementary mathematics.	No Prerequisite
Fundamentals of elementary mathematics. Algebra	No Prerequisite
Fundamentals of elementary mathematics. Geometry	No Prerequisite
Fundamentals of elementary mathematics. Arithmetic	No Prerequisite
Fundamentals of elementary mathematics. Probability Theory	No Prerequisite

The university elective courses	
Russian language	No Prerequisite
English language	No Prerequisite
Elective courses	
Applied mathematics	No Prerequisite
History of Mathematics	No Prerequisite
Nonlinear analysis	Mathematical analysis of multiple variables
Mathematical physics	Mathematical analysis of multiple variables
Differential equations in banach spaces	Mathematical analysis of multiple variables
Fourier series	Mathematical analysis of multiple variables
Abstract harmonic analysis	General algebra
Special parts of topology	General algebra
Geometry and Topology	General algebra