საქართველოს ტექნიკური უნივერსიტეტი
GEORGIAN TECHNICAL UNIVERSITY

Approved by
Resolution № 1 1933 of the
Academic Council of GTU
dated February 24, 2016

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dated March 29, 2021

PhD Educational Program

Program Title

მათემატიკა
Mathematics

Faculty

ინფორმატიკისა და მართვის სისტემების ფაკულტეტი
Faculty of Informatics and Control Systems

Program Head/Heads

Professor Aleks KIRTADZE

Qualification to be Awarded and the Extent of the Program in terms of Credits

PhD in Mathematics
will be awarded upon completion of the study component (not more than 60 ECTS credits) and the research component of the educational program. Duration of education is not less than 3 years.

Teaching Language

Georgian

Prerequisite for Admission to the Program

- Master's degree or equivalent academic degree with exact, natural science and engineering specializations.
- Successfully passing the interview with the faculty temporary commission. Scientific publications, participation in scientific conferences, other documents and materials related to educational/research activities (certificates, deeds, patents, etc.) are taken into account during the interview.
- Persons wishing to enroll in the program must submit: a research project, where the purpose and direction of the applicant's research are outlined;
- It is compulsory to present a certificate/document confirming the knowledge of the English language at least B2 level. The applicant, who cannot present the said certificate, is obliged to pass the test in the computer center of GTU in the English language. A PhD candidate who has completed an English-language (Bachelor's and/or Master's) program is not required to pass the exam and present a certificate. The procedure for admission to PhD studies and enrollment conditions, as well as samples of the exam test in a foreign language are provided on the university's website.
- Enrollment in the educational program is also possible on a mobility basis twice a year, within the time limits established by the Ministry of Education, Science, Culture and Sports of Georgia, following the compulsory procedures and the rules established by the university.
- Enrollment in the program or transfer from a recognized Higher Educational Institution of a foreign country is carried out in accordance with the rules defined by the legislation of Georgia.

Program Description

The program is compiled using the European credit transfer system ECTS. At GTU 1 credit is equal to 25 hours, including contact and independent work hours. The distribution of credits is presented in the program curriculum. The program lasts at least 3 years (6 semesters).

Program structure. The program consists of six elective special course groups (mathematical physics, mathematical analysis, discrete mathematics, numerical analysis, algebra-geometry-topology, mathematical statistics).

According to the curriculum, I and II semesters include 60 credits (30 credits are provided in each semester) and consist of:

a) From the compulsory education courses in the specialty - 40 ECTS (I semester 20 credits, II semester 20 credits)

b) From the compulsory elective courses in the specialty - 20 ECTS (I semester 10 credits, II semester 10 credits).

Academic Year Schedule

The academic year consists of two semesters - fall and spring. The dates of interim and final/additional examinations are set at the beginning of each semester by the Rector's order based on the Instructions for managing the educational process at Georgian Technical University, available on the GTU website

Research component

The research component is assessed once, and detailed information on its evaluation is provided in the "Teaching and Research Components of the Doctorate Educational Program and the Rules for Their Evaluation", on the website of the Georgian Technical University of Georgia.

The instructions for completing the thesis submitted for obtaining the PhD academic degree are given on the website of the Georgian Technical University.

Program Objective

The objective of the PhD program is:
- In-depth study and further development of methods of applied mathematics (mathematical physics, numerical analysis), pure mathematics (mathematical analysis, discrete mathematics, algebra, geometry and topology) and mathematical statistics;
- Application of studied methods in the analysis and research of mathematical-statistical models of modern technological processes, engineering science, information technologies, medical, banking-financial and social aspects.

Learning Outcomes/Competences (general and professional)

- Acquires knowledge based on the latest achievements in the field of study and activity, which allows the extension of existing knowledge or the use of innovative methods, including in a multidisciplinary or interdisciplinary context.
- Publishes articles in highly rated international scientific journals, participates in local and international scientific conferences and scientific programs.
- Researches specific theoretical and practical problems raised in the field of mathematical physics using the properties of functional spaces, generalized functions, potentials and corresponding boundary integral operators defined on areas with different geometric properties.
- Conducts research on different classes of measures in the issues of function and set measurability, single trigonometric, Walsh and Haar rows, orthogonal rows, collection and unity of multiple rows, summability of rows, existence of invariant and quasi-invariant measures and their continuity, unity property and related metric transitivity (ergodicity) using modern methods of theory.
- Researches the problems of discrete mathematics and uses the latest methods of discrete mathematics in set theory, mathematical logic, point set theory, game theory, graph theory, combinatorial geometry;
- Builds computational algorithms corresponding to various mathematical models, performs specific calculations and analyzes the obtained results using modern methods of numerical analysis.
- Researches theoretical mathematical and practical problems of various types using modern theories of general topology, dimensions, homology, homotopy, differential geometry, Lie groups, Lie algebras, non-Euclidean (affine, projective, etc.) geometries.
- For various observable stochastic processes, constructs its descriptive statistical structure, examines time series, assesses various statistical parameters, researches theoretical and practical problems raised in mathematical models with modern methods of mathematical statistics and probability theory.
- Plans and conducts research in compliance with the principles of academic integrity; Develops new research and analytical methods that are focused on the creation of new knowledge (required for internationally referral publications).
- Based on the critical analysis, synthesis and evaluation of new, complex and contradictory ideas and approaches, independently makes the right and effective decision for solving complex problems. Presents and conveys new knowledge to colleagues and the general public in a clear and well-founded manner. Participates in local and international thematic discussions.
- Forms justified conclusions and recommendations about the problems raised in various fields, the research of which requires the use of mathematical models.

Methods of achieving learning outcomes (teaching-learning)

☒ Lecture ☒ Seminar (group work) ☒ Practical ☐ Laboratory ☐ Scientific and - Thematic seminar ☒ Independent work ☒ Consultation ☒ Research component ☒ Structure of the thesis ☒ Thesis defense

In the learning process, depending on the specifics of a particular study course program, the following activities of the teaching-learning methods are used, which are outlined in the relevant study course programs (syllabi): discussion/debate, collaborative work, case study, brain storming, demonstration, induction, deduction, analysis, synthesis, oral or verbal work, writing work, observation, explanation, action-oriented learning, project development and presentation.

Activities corresponding to teaching-learning methods are provided on the website of the Georgian Technical university.

Student's Knowledge Assessment System

Educational program is assessed on a 100-point scale.

Assessment of the educational component:
A positive assessment of the education course determined by PhD educational program is the following:
- (A) – Excellent – 91% of assessment and above
- (B) – very good – 81 – 90 % of assessment
- (C) – Good – 71 – 80% of the assessment
- (D) – satisfactory – 61 – 70% of the assessment
- (E) – sufficient – 51 – 60 % of the assessment

A negative assessment of the education course determined by PhD educational program is the following:

- (FX) - Failed to pass – 41-50 % of the assessment, which means that the student needs more work to pass and is allowed to take an additional exam once with independent work;

In case of FX, an additional examination is scheduled no later than 5 days after the announcement of the results. The grade received at the additional examination is not added to the grade obtained at the final assessment.

- (F) - Failed - 40 points or less, which means that the work done by the student is insufficient and he/she will have to study the subject again.

Assessment of the scientific-research component/components:

Five positive and two negative assessments are used for the evaluation of the doctoral thesis.

Positive assessments are:

a) Excellent (summa cum laude) - excellent performance, 91-100 points;

b) Very good (magna cum laude) - result exceeding the requirements in all parameters, 81- 90 points;

c) Good (cum laude) - a result that exceeds the requirements, 71-80 points;

d) Satisfactory (bene) - an average level work that meets the basic requirements; 61 – 70 points;

e) Sufficient (rite) - a result that, despite its shortcomings, still meets the requirements, 51 – 60 points.

Negative assessments are:

a) Insufficient (insufficienter) - an unsatisfactory level work that cannot meet the requirements due to significant deficiencies in the work, 41-50 points;

b) Completely unsatisfactory (sub omni canone) - a result that completely fails to meet the requirements, less than 41 points.

Fields of employment

Persons with the academic degree of PhD in Mathematics, will be able to work in scientific-research institutes of a wide profile (mathematics, physics, informatics, economics, biology, geophysics and others), higher educational institutions, departments of financial institutions, engineering laboratories, educational system agencies where mathematical methods are used. Researching the problems of the mentioned fields of science and technology and developing methodical approaches.

Human and material resources needed to implement the program

The program is provided by highly qualified teaching staff who have professional experience and are engaged in intensive scientific and research work in parallel with teaching activities. Academic and visiting professors of the Department of Mathematics of the Georgian Technical University are the authors of the programs (syllabi) of the educational courses.

The program is provided with computer equipment, continuous Internet network, relevant scientific and teaching-methodical literature. The program is provided with appropriate infrastructure (learning materials, library, computer classes connected to the Internet, continuous electricity, heating system, restrooms). Additional information about the program's human and material resources can be found in the attached documents.

Number of attached syllabi: 18