PhD Program Title: Geometry, Topology and Applications

Awardable Degree – PhD in Mathematics

Program Leader: Prof. Malkhaz Bakuradze (Iv. Javakhishvili Tbilisi State University (TSU))

Program Participants: Prof. M. Shubladze, Prof. R. Surmanidze, Dr. N. Inasaridze, Dr. Bachuki Mesablishvili, Prof. Daniel C. Cohen (USA, Louiziana State University)

Requirement for enrolling: Pass the preliminary exam (interview) based on Master's program.

Prerequisites of enrolling: Master's degree either in mathematics, or applied mathematics, or physics, or in engineering. Knowledge of standard material from Algebra, Geometry, and Topology. PhD student should be able to speak and use scientific literature in English.

Qualificative description of the program:

The proposed program is complex in nature and contains several mathematical directions in which a doctoral student could work: Geometry, Differential Manifolds, Algebraic and Differential Topology, Homology Methods, and Applications.

There have been recent developments in applications of geometry and (algebraic) topology to the area of robotics, sensor networks, face recognition problems. For example, configuration spaces could be used to model robot motion planning, and analyze complexity of motion planning algorithms. A particular homotopy invariant of such spaces, so called navigational complexity, measures degree of complexity of such algorithms. Methods of algebraic topology, such as cohomology algebra, are used to estimate and calculate this homotopy invariant.

The problems being investigated by PhD students will be either theoretical, or could have such applications.

Tutorial of PhD Students: PhD students have to give twice in semester seminar lectures with own research and surveys of recent scientific literature.

Themes of theses should be approved at the end of the second semester.

Employment spheres: Education, scientific research, governmental and commercial (private) structures.

Structure of the program: About two semesters will be devoted to educational component (40-60 credits); the rest will be devoted to research component (120-140 credits) to meet the minimum required 180 credits.

Teaching component refers to the methods of Geometry and Topology.
It is foreseen to invite PhD students to lead practical, seminar and laboratory works of undergraduate students (up to 10 credits).

Research component of the program means investigation of problems in geometry and topology, and related questions of applied nature. In particular, homological and homotopy methods are the tools in dealing with such problems.

	COURSES	STATUS	CREDITS
University: compulsory			
1.	Modern technologies of teaching	compulsory	5
2.	I Doctoral Colloquium	compulsory	5
3.	II Doctoral Colloquium	compulsory	5
4.	Assistant Professorship	compulsory	5 - 10

In agreement with scientific advisor, doctoral student earns the remaining 20-40 credits attending various courses and seminars.

Materials and technical basis of study and research: A room with PC with Internet access and library in VIAM TSU.

Number of PhD Fellows: Maximum amount of available positions for PhD Fellows is 5.