

Title of the Program: Mechanics of Continua

Academic Degree Offered: Ph.D. in Applied Mathematics

Head of the PhD program: Prof. Dr. George Jaiani (Iv. Javakishvili Tbilisi State University (TSU), Faculty of Exact and Natural Sciences (FENS), Director of I.Vekua Institute of Applied Mathematics (VIAM))

Program Participants: Prof. Dr. D. Natroshvili, Prof. Dr. J. Sharikadze (VIAM TSU), Dr. N. Chinchaladze (TSU, FENS)

Qualification of the program:

a) Goals and Aims of the Program: The aim of the program is provide students with in-depth knowledge and research skills in PDEs, in particular, in degenerate ones; in interaction problems of multidimensional fields. In practice there are some PDEs with order degeneration which are not covered by the existing general theories of degenerate PDEs. The practical point of view makes necessary to investigate peculiarities of setting of BVPs for such classes, for example for classes arising concerning cusped bodies encountered in spatial structures with partly fixed edges, e.g., stadium ceilings, aircraft wings, submarine wings etc., in machine-tool design, as in cutting-machines, planning-machines, in astronautics, turbines, and in many other areas of engineering (e.g., dams).

In recent years the direct and inverse problems connected with the interaction between various vector fields of different dimensions have received much attention in the scientific literature of mathematics and engineering. They arise in many physical and mechanical models describing the interaction of two different media where the whole process is characterized by a vector-function of dimension k in one medium and by a vector-function of dimension n in another one (for example, fluid-structure interaction where a streamlined body is an elastic obstacle, scattering of acoustic and electromagnetic waves by an elastic obstacle, interaction between an elastic body and seismic waves, etc.). Last time the elastic solid-fluid problems became significant concerning problems arising in biology, medicine, etc. The problems investigated by PhD students will have such applications.

b) Learning outcome: After finishing the program PhD student will have acquired thorough knowledge in the field of order degeneration, BVPs and related issues and about the achievements of Georgian and international mathematicians. PhD students will gain appropriate skills to fulfill the scientific research independently and will be able to build and analyze the mathematical models of the natural processes.

c) Employment opportunities: Education, scientific research, governmental and private sectors.

Preconditions for Admission to the PhD Program:

- Master degree either in mathematics, or applied mathematics, or physics, or in civil

engineering.

- Knowledge of foundations of Partial Differential Equations (PDE) and Mechanics of Continua.
- PhD student should be able to speak and use scientific literature in English.
- Pass the preliminary exam (conversation) based on Master Program.

Structure of the program: First two semesters will be entirely devoted to teaching component (60 credits); the rest will be devoted to research component (120 credits)

Structure of the PhD Program

Teaching components that shall be administered by the TSU:

	Name	Status	Number of Credits
1.	Modern technologies of teaching	obligatory	5
2.	I Doctoral Colloquium	obligatory	5
3.	II Doctoral Colloquium	obligatory	5
4.	Assistant of Professor	obligatory	5
Teaching components that shall be administered by PhD Program :			
5.	Mathematical Models of Mechanics of Continua	obligatory	10
6.	Partial Differential Equations	obligatory	10
7.	Solid-Fluid Interaction Problems	obligatory	5
8.	Degenerate Partial Differential Equations	obligatory	5
9.	Introduction to the theory of Cusped Beams, Plates, and Shells	obligatory	5
10.	Cusped Elastic Solid-Fluid Interaction Problems	obligatory	5

Teaching component refers to the methods of PDEs and mechanics of continua.

Research component of the program means investigation of some classes of PDEs, in particular, degenerate ones; correct setting of the boundary value problems (BVPs) in corresponding functional spaces, their analytical (explicit) and numerical solving for interaction problems of multidimensional vector fields (in particular, elastic solid-fluid interaction problems).

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

Doctoral Thesis – 120 credits

Tutorial of PhD Students: Twice in a semester PhD students will give seminar lectures with own research and surveys of recent scientific literature.

Material-technical base of the scientific research: PCs with Internet access and library in VIAM TSU.

Duration of Study 5 years.

Number of Ph.D Students to be accepted- 3