**PhD Program Title:** Mechanics of Continua

**Awardable Degree** – PhD in Applied Mathematics

**Program Leader:** Professor George Jaiani (Iv. Javakhishvili Tbilisi State University (TSU), Director of I.Vekua Institute of Applied Mathematics (VIAM))

**Program Participants:** Prof. Dr. D. Natroshvili, Prof. Dr. J. Sharikadze, Dr. N. Chinchaladze

**Requirement for enrolling:** Pass the preliminary exam (conversation) based on Master program.

**Prerequisites of enrolling:** 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.

**Qualificative description of the program:** The aim of the program is intensification of knowledge and research in PDEs, in particular, in degenerate ones; in interaction problems of multidimensional fields. In practice there arise some classes 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 different vector fields of different dimensions have received much attention in the mathematical and engineering scientific literature and have been intensively investigated. 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 become very important concerning problems erasing in biology, medicine, etc. The problems being investigated by PhD students will 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:** First two semesters will be entirely devoted to educational component (60 credits); the rest will be devoted to research component (120 credits)

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

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 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).

| | COURSES | STATUS | CREDITS |
|---|---|---|---|
| **University: compulsory** | | | |
| 1. | Modern technologies of teaching | compulsory | 5 |
| 2 | PhD student's Colloquium | compulsory | 5+5 |
| 3 | Assistance of Professor | compulsory | 5 |
| **Faculty: compulsory** | | | |
| 5. | Mathematical Models of Mechanics of Continua | compulsory | 10 |
| 6. | Partial Differential Equations | compulsory | 10 |
| 7. | Solid-Fluid Interaction Problems | compulsory | 5 |
| 8. | Degenerate Partial Differential Equations | compulsory | 5 |
| 9. | Introduction to the theory of Cusped Beams, Plates, and Shells | compulsory | 5 |
| 10. | Cusped Elastic Solid-Fluid Interaction Problems | compulsory | 5 |

**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 are 3.