Akaki Tsereteli State University

Tbilisi State Medical University

Georgian Technical University

Faculty – Medicine

Master's Program– „Biomedical Engineering"

Language of Instruction – Georgian

Accreditation Date – 31.12 2026

Heads/Supervisors of the Program:

Professor Irine Pkhakadze, MD., PhD (ATSU);
Professor Tamar Sanikidze, MD., PhD (TSMU);
Professor Irina Gotsiridze, MD., PhD (GTU).

Title of Educational Programme	*Master's Programme „Biomedical Engineering"*
Level of the study	Second Level
Awarded academic qualification/degree	Master of Biomedical Sciences
Credit Value of the Program	Educational program includes 120 ECTS credits, The program is implemented jointly by three higher educational institutions of Georgia: Akaki Tsereteli State University, Tbilisi State Medical University and Georgian Technical University (one credit earned at ATSU equates to 25 academic hours, one credit at TSMU to 30 academic hours, And at GTU to 25 academic hours , respectively).
Language of Instruction	Georgian
Programme Objectives	Biomedical engineering, a rapidly expanding interdisciplinary domain of the 21st century, amalgamating expertise from engineering, biology, medicine, and computer sciences. Its primary objective lies in safeguarding of human health while driving the delivery of top-tier medical services. The BME-ENA Biomedical Engineering Education Tempus Initiative in the Eastern Neighboring Area (Project number: 543904-TEMPUS-1-2013-1-GR-TEMPUS-JPCR) was designed to extend the scope of training for practitioners in the field of biomedical engineering from Europe to the east. As part of this initiative, the implementation of a master's educational program was planned, aiming to produce successful and competitive specialists. Based on the above, there is unequivocal confidence in the suitability of this optimal model for program development by the universities of medical and/or technical profile. Leveraging their extensive experience in life sciences, Tbilisi State Medical University and Akaki Tsereteli State University, along with Georgian Technical University's track record in biomedical engineering education at various academic levels (Bachelor, Master and Doctoral levels), collaborated to develop and implement a new master's program. This joint effort represents a sophisticated undertaking that necessitates close coordination among the partners involved. The program aims to equip graduates with the expertise needed to become competitive specialists capable of ensuring high-quality healthcare, possessing the necessary knowledge and skills to navigate evolving processes and changes in the healthcare sector effectively. Graduates will be proficient in managing medical equipment and systems within healthcare institutions, as well as facilitating improvements and streamlining processes and supporting organizational changes in the biomedical field; The master's program emphasizes the development of research skills through hands-on research experiences and student-centered teaching approaches. It provides opportunities for students to employ interdisciplinary education in tackling biomedical challenges, laying the groundwork for their career advancement as biomedical engineers. By offering a comprehensive understanding of the field, the program ensures that master's students acquire the requisite knowledge to become engineer-researchers proficient in addressing complex biomedical issues. Graduates, in cooperation with physicians, will contribute to the medical equipment installation process, moreover, they will possess the capability to effectively manage and maintain complex medical equipment and systems across diverse clinical settings and other healthcare facilities.
Prerequisites /Requirements for	- Minimum of Bachelor's academic degree; - Successful passing of the unified national Master's exam; - Positive results in Physics, Informatics and English language (B-1) at the Internal university examination.

admission to the program	Note: For citizens of foreign countries, it is imperative to provide an equivalent document, stipulated by the interstate agreement (in accordance with requirements outlined in Article 50 of the Law of Georgia "On Higher Education").
Teaching Methods	- Interactive lectures (using visual material); –Laboratory/practical sessions; –Consultations; –Discussions/debates; - Independent work, clinical practice, seminars; Master's thesis.
Study Plan/Curriculum	Duration of the educational program - 2 academic years, 4 semesters. **The First Semester (30 ECTS credits)** is carried out at Akaki Tsereteli State University. This semester is dedicated to laying the groundwork for understanding the structure and normal functioning of human organ systems through theoretical basic medical courses. Additionally, students delve into the fundamentals of legal regulatory legislation and healthcare technologies within the healthcare sector. **The Second Semester (30 ECTS** credits) is carried out at the Tbilisi State Medical University and is devoted to the study of physical foundations of commonly employed diagnostic and treatment methods in medicine and planning of a master's research projects. **The Third Semester (30 ECTS** credits) is carried out at the Georgian Technical University and is devoted to the study of medical electronics, biomedical signal processing, management and modeling of medical systems. **The Fourth Semester (30 ECTS** credits) is dedicated to performance of the Master's thesis and it will be carried out according to the student's choice based on the topics offered by the universities. *The educational programme includes elective courses with including 8 ECTS credits, envisaging the transparency of choice.*
Learning Outcomes	**Knowledge and Understanding** Based on deep, systematic field and research-based knowledge acquired upon completion of the program, the graduate demonstrates state-of-the-art knowledge of theory and principles, specific methods/issues envisaged by the programme, alongside practical experience gained through research endeavors and/or professional practice. The graduate can: - Demonstrate deep, systematic knowledge in the field of engineering, physics, and biomedical sciences in accordance with the researches conducted. - Provide information regarding the latest advancements in diagnostic and treatment technologies within healthcare, the role played by information and communication technologies in patient monitoring and healthcare management processes. Demonstrate proficiency in discussing ethical norms and research principles relevant to the biomedical field. - Provide information on recent advancements in diagnostic and treatment technologies within healthcare, investigate the pivotal role of information and communication technologies in patient monitoring and healthcare management, and delve into the ethical principles guiding biomedical research and practice. **Ability** A graduate has the ability of:

	Operating in a new, multidisciplinary environment; applying acquired knowledge and skills in the field of medical industry, treatment/diagnostic facilities, laboratories and equipment service and administration. - Seeking for novel approaches and embrace fresh endeavors within the realm of modern biomedical engineering in order to solve complex problems. - Carrying out research independently using the latest methods and approaches. - Participating in the implementation of modern medical therapeutic and diagnostic equipment services as well as implementation of research and practical projects. - Assessing the risks inherent in particular medical or diagnostic instrumental procedures, while considering the individual metabolic and constitutional traits of each patient. - Analyzing the "benefit-risk" principles pertinent to medical procedures and utilizing diverse international or national “guidelines” to assess the “viability” of the procedure. - Providing simple, household-level explanations to patients regarding the advantages and potential risks associated with the medical procedure. - Using modern information technologies and computing tools for technical purposes. Ability to operate in a new, unpredictable and multidisciplinary environment. A graduate has the ability of: - Formulating substantiated conclusions based on the critical analysis of the information obtained as a result of the latest research and envisaging ethical and social responsibilities. - Performing innovative analysis of information based on the latest data, operating with various guidelines and normative documents. - Based on the results obtained by different methods, making reasoned conclusions, fostering communication within the academic and professional community, collaborating with diverse medical and support personnel of varying expertise, and effectively communicating with non-specialists, including in foreign languages. Additionally, adeptly preparing a variety of written documents and reports at the academic level. - Conducting an objective assessment of personal knowledge, skills, and professional experience, recognizing opportunities for self-improvement, and continually updating and enhancing knowledge of new technologies, capabilities, and operational protocols in the field. - Recognizing the necessity for continuous professional advancement and autonomously planning and executing learning initiatives to enhance expertise. - Independently conducting the learning and research process, adeptly analyzing and comprehending information sourced from a wide array of international and national internet resources, including expert and “professional” organizations specializing in biomedical engineering. **Responsibility and autonomy** Upon completing the master's program in Biomedical Engineering, the graduate demonstrates a contemporary perspective on healthcare and biomedical engineering challenges, leveraging novel sectoral knowledge; professional integrity, actively contributing to the establishment of innovative values, while respecting and embracing diverse viewpoints. Furthermore, they evaluate their own and others' adherence to values and actively contribute to the development of the professional community. Simultaneously, they grasp the values and principles inherent in the European higher education space, recognizing the key factors shaping a competent specialist in the realm of biomedical engineering.

Fields of Graduate Employment	- Private national and international medical industrial, treatment/diagnostic facilities, laboratories, pharmaceutical companies. - Pharmaceutical enterprises, drug quality control and standardization laboratories; - Forensic-medical examination centers; - Different sectors of universities and scientific-research institutes. - Organizations and companies where processing and improvement of medical products, devices, equipment are carried out. - Representations of foreign medical equipment manufacturing companies. - Medical equipment service agencies and firms/companies.

Curriculum

(I-IV Semesters)

Master's Programme „Biomedical Engineering"

№	Study Course	Lecture/Practice./Seminar Labs.	Number of Credits	Hours			Semesters				წინაპირობები
				Contact**	Independence learning	In total	I	II	III	IV	
1	Basics of biochemistry	10/20	3	30/2	43	75	3				
2	Fundamentals of human anatomy and physiology (functional anatomy)	20/40	6	60/2	88	150	6				
3	Bioethics and Humanism	10/20	4	30/2	100	68	4				
4	Healthcare Technologies, Assessment and Management	10/30	4	40/2	58	100	4				
5	Healthcare organization and management	15/30	5	45/2	78	125	5				
6	English Language	0/30	5	30/2	93	125	5				
7	Elective Course 1	0/15	3	15/2	58	75	3				
							30				
	Elective Course 1										
1.1.	Patient safety and the hospital environment										
1.2.	Regulatory-legislative base and standards for healthcare technologies										
8	Biomedical Physics	22/28	4	50/4	66	120		4			

9	Higher mathematics	12/24	2	36/2	22	60		2			
9	Biomedical statistics	24/40	4	64/2	54	120		4			
10	Physical principles and methods in medicine	40/60	8	100/4	136	240		8			
11	Modern methods of medical visualization/imaging and associated risks	20/34	4	54/4	62	120		4			
12	Research methodology	22/50	8	72/4	164	240		8			
								30			
13	Medical electronics	30/30	5	60/2	73	135			5		10
14	Visualization of medical objects and image processing	30/30	5	60/2	73	135			5		11
15	Biomedical Embedded Systems and Sensors	30/30	5	60/2	73	135			5		9
16	Modeling and management in medical systems	30/30	5	60/2	73	135			5		8
17	Clinical engineering/practice	**-/**60	5	60/2	73	135			5		10
18	Elective Course 2	30/30	5	60/2	73	135			5		
									30		
	Elective Course 2										
2.1.	Medical informatics and telemedicine										5
2.2.	Nanotechnologies in medicine										1
19	Master's thesis	–	30	30	870	900				**30**	