საქართველოს ტექნიკური უნივერსიტეტი
GEORGIAN TECHNICAL UNIVERSITY

Biomedical Engineering
Bachelor of Science English Language Program

ბიოსამედიცინო ინჟინერია
Biomedical Engineering

Faculty

ინფორმატიკის და მართვის სისტემების ფაკულტეტი
Faculty of Informatics and Control Systems

Program Supervisor/ Supervisors

Professor Irine Gotsiridze

Qualification to be Awarded, and the Number of Credits in the Program

Bachelor of Sciences in Biomedical Engineering Will be awarded in case of passing main speciality (220 credits) and free components (20 credits) of educational program, no less than 240 credits.

The Language of Teaching

English

Admission Prerequisites to the Program

An applicant has the right of teaching on foreign educational program when he has the permission in accordance with Georgian Legislation. The applicant must have the certificate confirming the knowledge of English on the level not less than B1 or must present international certificate TOEFEL (The Test of English as a Foreign Language) of II certification level. The applicant is free from the necessity of presenting a certificate confirming his/her competence at having completed course in the foreign language that is educational language of the program was English. At not having appropriate certificate or other analogous document, the applicant will have an interview in English. The interview will be implemented with the temporary commission which part the staff of GTU.

Program Description

The program is drawn up with ECTS system, 1 credit is equal to 25 hours, implying both contact and independent work hours. The distribution of credits is presented in the curriculum. The program duration is 4 years (8 semesters) and includes 240 credits (ECTS). Content, training methods and number of the credits of learning courses of the program provides achievement of a goal and results of educational program. To obtain Bachelor degree student must cover 240 credits.
To obtain the B.S. in Biomedical Engineering, a student must obtain different course credits in: Mathematics and Basic Sciences, Engineering Basics and Speciality Obligatory Core and Elective Courses, also University Elective Humanities Courses.
The distribution of hours is presented in the educational plan
The annual learning process:
The annual learning process contains two semesters, with duration 21 weeks. Students assessment is made by Current Activity, Midterm Exam And Final/Additional Exam Teaching period is during 15 weeks (I-XVI weeks). The Dates of Midterm Exam and Final/Additional Exam are defined at the beginning of each semester by the Rector's order based on the learning process schedule. The right to pass the final exam has a student that collected no less than minimum points: Current Activity (15 points) and in Midterm Exam (7.5 points). The minimum positive estimation of final/additional exams is 10 points. A semester contains 30 credits and, accordingly, a year contains 60 credits.
Evaluating Student Performance
Student Performance is evaluated a maximum of 100 points, 30 of which is current assessment during 15 weeks (homework, quizzes, presentation in the class, team or individual projects). Midterm and final exams can be evaluated by tests, presentation in the class, team or individual projects. Forms of a Midterm and final exam evaluation may vary for different subjects. Students' work and study success are evaluated according to the syllabus of each course, which is a combination of Midterm and Final/additional exams.
The program consists from various objective oriented leaning courses, according to the semester.
During I semester students will cover learning courses: Mathematics, Physics, Information Technologies, Introduction Biomedical Engineering Courses – in total 30 credits.
During II-V semesters students will cover leaning courses: Mathematics, Physics, Basic Engineering and Core Engineering mandatory and elective courses, also university humanitarian elective courses (Free components). In total 30 credits for each semester.
During VI semester students will cover five obligatory and one humanitarian elective courses (Free components), Total 30 credits for semester.
During VII semester students will cover obligatory course of Team Project (6 credits) and professional elective Biomedical Engineering Courses (24 Credits). In total 30 credits for semester.
During VIII semester students will cover three professional elective courses (each 6 credits) and obligatory Capstone Project (12 credits). In total 30 credits for semester.
The bachelor's final / capstone project defense assessment includes a written report and presentation.

In development and carrying out monitoring of the program is included "Committee of Support for Developing of BME Study", which is founded at the "Biomedical and Clinical Society of Georgia", Committee is comprised with 5 permanent members.

Program Educational Objectives

The undergraduate Biomedical Engineering Program Educational Objectives (PEO's) are that our

alumni:

- will be engaged in professional practice as biomedical engineers and/or biomedical scientists in occupational settings involving human health and well-being (PEO 1),
- will advance in their professional careers (PEO 2)
- will engage in professional development, or post-graduate education, to continue their self-development in biomedical engineering or other related fields (PEO 3

The Students Learning Outcomes

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors

3. an ability to communicate effectively with a range of audiences

4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts

5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies..

Methods (teaching - learning) of Achieving Learning Outcomes

☒ Lecture ☒ Seminar (working in groups ☒ Practical class ☒ Laboratory ☒ Practice ☒ Course work/project ☒ Consultation ☒ Independent work

Based on the specifics of a learning course, the appropriate activities listed below are employed, reflected in the relevant learning courses (syllabi):

Student Knowledge Assessment System

Grading system is based on a 100-point scale.

Positive grades:

- (A) - Excellent - the rating of 91-100 points;
- (B) – Very good - - the rating of 81-90 points
- (C) - Good - the rating of 71-80 points
- (D) - Satisfactory - the rating of 61-70 points
- (E) - Enough - the rating of 51-60 points

Negative grades:

- (FX) - Did not pass - 41-50 points of rating, which means that the student needs more work to pass and is given the right to take the exam once more with independent work;
- (F) – Failed - 40 points and less, which means that the work carried out by the student is not enough and he/she has to learn the subject from the beginning.

Each form and component of the evaluation from the general score of the assessment (100 points) has a definitive share in the final assessment. In particular, the maximum score of the intermediate score is 60 Ongoing Activity +Midterm Exams), and the maximum score of the final exam - 40.
The forms of assessment:

- Ongoing Activity
- Midterm Exams
- Final/ Additional Exams

One Midterm exam is conducted during the semester. It is obligatory component of interim assessment.
Assessment methods and criteria are detailed in the syllabus of courses,

Sphere of Employment

Biomedical engineers are employed in industry, in hospitals, in research facilities of educational and medical institutions, in teaching, and in government regulatory agencies. They often serve a coordinating or interfacing function, using their background in both the engineering and medical fields. In industry, they may create designs where an in depth understanding of living systems and of technology is essential. They may be involved in performance testing of new or proposed products. Government positions often involve product testing and safety, as well as establishing safety standards for devices. In the hospital, the biomedical engineer may provide advice on the selection and use of medical equipment, as well as supervising its performance testing and maintenance. They may also build customized devices for special health care or research needs. In research institutions, biomedical engineers supervise laboratories and equipment, and participate in or direct research activities in collaboration with other researchers with such backgrounds as medicine, physiology, and nursing. Some biomedical engineers are technical advisors for marketing departments of companies and some are in management positions.

In representative firms of vendors of medical devices, for carrying out of marketing and service. Also as Health Information Technology (HIT) specialists of information technologies for processing of medical information. Graduates can be employed at Scientific-Research Institutes and Centers of the Georgian Technical University (Eliashvili Institute of Control Systems, V. Chavchanidze Institute of Cybernetics, Center of Biotechnology).

Potential for Further Education

Master's Educational Programs

Human and Material Resources Required to Implement the Program

The program provides the appropriate human and material resources. In the program implementation, there are involved professors from West Pomeranian University of Technology according the Co-Operation Agreement between the Georgian Technical University and West Pomeranian University of Technology. For more information see the attached syllabi and other attachment documentation

Courses in the Program

№	Course	Admission Prerequisites	ECTS Credits							
			I Year		II Year		III Year		IV Year	
			Semester							
			I	II	III	IV	V	VI	VII	VIII
1	Engineering Mathematics 1	N/A	6							
2	Physics A	N/A	5							
3	Introduction to general and organic chemistry	N/A	5							
4	Programming in Visual Studio	N/A	4							
5	Introduction to Biomedical Engineering	N/A	5							
6	Electrophysiology	N/A	5							
7	Engineering Mathematics 2	Engineering Mathematics 1		6						
8	Physics B	Physics A		5						
9	Biomechanics of Human Body	Electro physiology		4						
10	Human Physiology	Electrophysiology		5						
11	Object-oriented Programming - 1(based on C++)	N/A		5						
12	Free components University Elective 1									
12.1	Georgian History and Culture	N/A		5						
12.2	Art Trough the age	N/A								
13	Engineering Mathematics 3	Engineering Mathematics 2			6					
14	Physics C	Physics B			5					
15	Electrical Circuits 1	Physics B			5					
16	Biomedical Measurements	Introduction to Biomedical Engineering			5					
17	Lab View Programming Methods	Object-oriented Programming - 1(based on C#)			4					
18	Biomedical Instrumentation	Introduction to Biomedical			5					

№	Course	Admission Prerequisites	ECTS Credits							
			I Year		II Year		III Year		IV Year	
			Semester							
			I	II	III	IV	V	VI	VII	VIII
		Engineering								
19	Linear Algebra	N/A				6				
20	Biophysics	Physics A				5				
21	Electrical Circuits 2	Electrical Circuits 1				5				
22	Medical device design	Biomedical Instrumentation				5				
23	Biomedical Transducers	Biomedical Measurements				4				
24	Free Components University Elective 2					5				
24.1	Design and Society	N/A								
24.2	Principles of Contemporary Management	N/A								
24.3	Biomomicry and Sustainability	N/A								
25	Basics of Medical Electronics	Biomedical Transducers					6			
26	Control Systems in Biology and Medicine	Linear Algebra					5			
27	Bioinformatics In Matlab	Electrophysiology					5			
28	Materials for Medical Devices	Introduction to general and organic chemistry					4			
29	Fundamentals of probability theory	Engineering Mathematics 2					5			
30	Modeling in Electronics Workbench	Basics of Medical Electronics					5			
31	Health Care Management and Economics	Fundamentals of probability theory						5		
32	Clinical Practice	Medical devices design, Biomedical Instrumentation						6		
33	Quality Control Of Medical Devices	Basics of Medical Electronics						5		

№	Course	Admission Prerequisites	ECTS Credits							
			I Year		II Year		III Year		IV Year	
			Semester							
			I	II	III	IV	V	VI	VII	VIII
34	CAD Systems	N/A						5		
35	Fundamentals of Business Communication	N/A						4		
36	Free Components University Elective 3									
36.1	Introduction to Ergonomics	N/A						5		
36.2	Job Analysis Methods	N/A								
37	Team Project	Modeling in Electronics Workbench CAD systems, Clinical Practice							6	
38	Professional Electives 1									
38.1	Microprocessor Medical Systems	Object-oriented Programming - 1(based on C#), Basics of Medical Electronics							6	
38.2	Biomedical Signal and Image Processing	Linear Algebra								
39	Professional Electives 2								6	
39.1	Clinical Diagnostic Laboratory Devices	Clinical practice								
39.2	Interfaces Of Medical Systems	Object-oriented Programming - 1(based on C#), Basics of Medical Electronics								
40	Professional Electives 3								6	
40.1	Mobile Health Systems	Programming in Visual Studio Lab View Programming Methods,								
40.2	Telemedicine	Programming in Visual Studio Lab View Programming Methods,								
41	Professional Electives 4								6	

№	Course	Admission Prerequisites	ECTS Credits							
			I Year		II Year		III Year		IV Year	
			Semester							
			I	II	III	IV	V	VI	VII	VIII
41.1	Hospital Administration And Management	Health Care Management and Economics,								
41.2	Distance Medical Systems	Biomedical Transducers								
42	Professional Electives 5									6
42.1	Medical Informatics	Health Care Management and Economics, Bioinformatics In Matlab								
42.2	Medical Sensors	Electrophysiology, Biophysics								
43	Professional Electives 6									6
43.1	Radiological Physics and Dosimetry	Physics C, Biophysics								
43.2	MRI Tomography	Physics C, Biophysics								
44	Professional Electives 7									6
44.1	Artificial Organs and Biotechnical systems	Human Physiology, Materials for Medical Devices								
44.2	Mathematical Models in Biology and Medicine	Engineering Mathematics 3								
45	Capstone Design Project	Team Project, Fundamentals of Business Communication								12
		Per semester	30	30	30	30	30	30	30	30
		Per year	60		60		60		60	
		Total	240							