



საქართველოს ტექნიკური უნივერსიტეტი
GEORGIAN TECHNICAL UNIVERSITY

Approved by Academic Council of GTU on
“_28_06_”
by Decree

№...942....
For the purpose of modification,
the project for representation in Academic
Council of GTU is prepared

Bachelor’s Degree Program

Program Title

Biomedical Engineering

Faculty

Informatics and Control Systems

Program Supervisor

Full Professor Irina Gotsiridze

Awarded Qualification

Intermediary Qualification in Instrumentation, Automation and Control Systems

Will be awarded in case of passing a of 180 credits of educational program(among them free module minimum 60 credits).

Bachelor of Engineering in Instrumentation, Automation and Control Systems

Will be awarded in case of passing of 180 credits of educational program(among them free module minimum 60 credits) and combination of the current courses of University. Minimum 240 credits.

Language

English

Program Objective

The program educational objectives Of Biomedical Engineering Program is giving students knowledge how to apply their fundamental engineering skills to solving problems in medicine and biology. Program covered include, medical instrumentation and design, physiology, biomaterials, mass transport, application of computers in medicine, artificial implants, and medical imaging. Anatomy and physiology as they relate to specific applications to bioengineering will be reviewed. It is intended to facilitate the student’s understanding in all areas of Biomedical Engineering so that they can appreciate the collaborative nature of the field. Provide an empowering professional degree for students who intend to become practicing engineering.

Program prerequisites

Applicant is admitted in compliance with the Georgian Legislation. The knowledge of language of the Degree Program is necessary.

Learning Outcome/Competencies Outcomes

– Knowledge and understanding:

√ Knowledge of the field of Biomedical Engineering, understanding of theory and principles; Knowledge of medical and biomedical engineering terminology.

▲ Students will learn to model biomedical systems, to access research databases to research the engineering and medical literature. The student will learn to use the internet and library resources to write a literature review paper. The student will learn principles relevant to each discipline within Biomedical Engineering and identify examples of the industrial and academic aspects of bioengineering, including basic and applied research. Understanding of a role of the clinical engineer in Health Care.

– Applying Knowledge:

√ Using of the specific for the field of Biomedical Engineering problem, the student will be able to solve biomedical engineering related problems in electrical circuits, mechanics, systems engineering and fluid and mass transport using mathematics.

▲ Development of research or practical projects in the accordance; Develop critical review skills, in the area of Bio-Medical Engineering. To develop the ability to critically evaluate current advances in issues and controversies in the area of Biomedical Engineering. An ability to apply knowledge of mathematics, medical science and engineering to biomedical engineering problems. An ability to design and conduct experiments, as well as to analyze and interpret data . An ability to make measurements and interpret data from living systems, addressing the problems associated with the interaction between living and non-living materials and systems. Clear public presentation of opinions in accordance with corresponding knowledge and logic for professional and general audience. An ability to use the techniques, skills, engineering and computing tools necessary for engineering practice . An ability to function on multi-disciplinary teams . The capability to apply mathematics (including statistics) and engineering skills to solve the problems at the interface of medical Systems. A recognition of the need for, and an ability to engage in life-long learning . A knowledge of contemporary issues

-Making judgments:

√The broad education necessary to understand the impact of engineering solutions in a societal context , also analysis of data and/ or situations analysis by the mean of standard and some distinctive methods and form of there as one conclusions on their basis;

▲ Purposeful education for decision-making with the purpose to make the inferences.

Data analysis according to standards and different methods for the reasoned inferences.

– Communication skills:

√An ability to communicate effectively orally and in writing. Preparing of detailed written reporting concerning ideas, existing problems and their solutions; information pass orally to professionals and non professionals; Creative use of modern engineering, information and communication technologies ;

▲ Preparation of the detail written report on the ideas, existing problems and from oral transmission to experts and nonexperts by means of high-quality and quantitative information. Creative use of the modern information communication technologies, for achievement of the working purposes

– Learning skills:

√Multilateral and consistent assessment of own learning process; determining of necessity of further studying; determining of directions of own learning with the goals of enrichment of professional knowledge and experience.

▲ Ability of search, assimilation of the relevant information for the purpose of extension of area of knowledge and experience in the medicine sphere. In the field and in the general sphere independent implementation of learning activity and the high level of strategic planning this process.

– Values:

√Participation in the process of values formation and aspirations to their sustainable implementation; Defense of professional values (accuracy, punctuality, objectivity, transparency, organization, etc.); An understanding of

professional and ethical responsibility of Biomedical (Clinical) Engineer.

^The direction of operation of medical institutions for safety and continuous improving of the ecological and safe environment. Understanding of professional and ethical responsibility of the biomedical engineer. Observance of norms of ethics and moral responsibility and values in formation of this process. Involvement in their development and implementation.

Forms and Methods of achieving of the learning outcomes

Lecture Seminar (working in the group) Practical classes Laboratory classes Practice
 Course Work/Project Independent Work

Forms and Methods of achieving the learning outcomes are included to the Educational Program and can be find via the following link: <http://www.gtu.ge/quality/pdf/sc.pdf>

Student's Knowledge Assessment

Assessment is based on a 100 point grading scale.

Positive assessment is:

- (A) - excellent - 91% and more of the maximum grade;
- (B) - very good - 81-90% of the maximum grade;
- (C) - good - 71-80% of the maximum grade;
- (D) - satisfactory - 61-70% of the maximum grade;
- (E) - enough - 51-60% of the maximum grade;

Negative assessment is:

- (FX) - not passed - 41-50% of the maximum grades. It means that a student needs more individual work, and is given one more possibility to pass the exam;
- (F) - failed - 40% and less of the maximum grade. It means that work performed by a student was not enough and the subject should be learnt from the beginning;

For assessment methods, criteria and scales please refer to the following link:

<http://www.gtu.ge/quality/axali/shefasebisforma.pdf>.

For assessment Research Components please refer to the following link:

http://www.gtu.ge/study/scavleba/samag_Sefas.pdf

Spheres of Employment

Organizations and companies which perform: improve, design, development and using of medical equipments, devices and items such They may research with scientists, chemists, and physicians in hospitals and universities. They also help maintain and monitor complex medical systems while working in hospitals.

Enormous job opportunities in varied spheres like medical equipments manufacturing, orthopedic and rehabilitation engineering, in public and in corporate sectors are available for the biomedical engineers. They can also be absorbed in hospitals to provide valuable advice on the status of medical equipments. Biomedical engineers can also employ themselves in research activities by working harmoniously with doctors in the field of computational mechanics, physiology, medicine and invent cutting - edge technology. In representative firms of vendors of medical devices, for carrying out of marketing and service. Also as Health Information Technology specialists of information technologies for processing of medical information.

Possibilities for further continues education

Master's educational programs

Required human and material resources

The program provides the appropriate human and material resources. For more information see the attached syllabi.

The number of attached syllabi: 52

The short-cycle subject load of program

Nº	Course Code	Course	Prerequisite	ECTS CREDITS			
				1 year		II year	
				Semester			
				I	II	III	IV
1	MAT01E8	Mathematics 1	Don't have	5			
2	PHY01E8	Physics 1	Don't have	4			
3	ECGRPE8	Engineering Computer Graphics	Don't have	5			
4	IIT01E8	Introduction in Information Technologies	Don't have	5			
5	FUCAOE8	Fundamentals of Computer Architecture and Organization	Don't have	4			
6	IBMDEE8	Introduction in Biomedical Engineering	Don't have	7			
7	MAT02E8	Mathematics 2	Mathematics 1		5		
8	PHY02E8	Physics2	Physics 1		4		
9	MINSSE8	Medical Instrumentation Systems	Don't have		5		
10	MCHHBE8	Mechanics of Human Body	Don't have		5		
11	AFPREE8	Algorithmization Fundamentals and Programming Elements	Don't have		6		
12	BPHYSE8	Biophysics	Don't have		5		
13	DIMATE8	Discrete Mathematics	Mathematics2			5	
14	PHY03E8	Physics 3	Physics2			4	
15	ELMSRE8	Electrical Measurements	Don't have			5	
16	FMEDLE8	Fundamentals of Medical Electronics	Don't have			6	
17	OOP01E8	Object-Oriented Programming	Algorithmization Fundamentals and Programming Elements			5	
18	ELPHSE8	Electrophysiology	Don't have			5	
19	HPSHLE8	Human Physiology	Electrophysiology				5
20	MELWSE8	Modeling in Electronic Workbench Space	Don't have				6
21	MTRMDE8	Materials for Medical Devices	Don't have				5
22	ENMDTE8	Elements and Nodes of Medical Technics	Don't have				6
23	BUSCOE8	Business Correspondence	Don't have				3
24	CABMEE8	CAD Systems	Engineering Computer Graphics				5

Free modules

Module1 (Should not exceed 60 credits in total): Medical Technics and Technologies**Directed by:** Full Professor Levan Lazarashvili**Pre-requisites for admission:** at least 90 ECTof a short cycle

Nº	Course Code	DISCIPLINE	Prerequisite	ECTS Credits
1.1	LVPRME8	Lab View Programming Methods	Don't have	5
1.2	BMDMSE8	Biomedical Measuring	Introduction in Biomedical Engineering	5
1.3	MEDELE8	Medical Electronics	Fundamentals of Medical Electronics	5
1.4	BMDTRE8	Biomedical Transducers	Don't have	5
1.5	BBMSPE8	Basis Of Biomedical Signal Processing	Don't have	10
1.6	CTSYSE8	Control Systems in Medicine	Don't have	5
1.7	BMDEQE8	Biomedical Equipments	Don't have	5
1.8	BMDESE8	Biomedical Equipments Service	Elements and Nodes of Medical Technics	5
1.9	BMNTPE8	Team Project in Biomedical Engineering	Medical Instrumentation Systems	10
1.10	BINFME8	Bioinformatics in MATLAB	Algorithmization Fundamentals and Programming Elements	5
Total			60 credits	

Module 2 (Should not exceed 60 credits in total): Medical Computer Systems**Directed by:** Full Professor Zviad Gurtskaia**Pre-requisites for admission** at least 90 ECTof a short cycle

Nº	Course Code	DISCIPLINE	Prerequisite	ECTS CREDITS
2.1	MPMSSE8	Microprocessor Medical Systems	Elements and Nodes of Medical Technics	5
2.2	MMBMSE8	Mathematical Modeling of Biomedical Systems	Don't have	5
2.3	HLINSE8	Health Information Systems	Don't have	5
2.4	MBHLTE8	Mobile Health	Don't have	5
2.5	INFMSE8	Interfaces of Medical Systems	Don't have	5
2.6	CDLDVE8	Clinical Diagnostic Laboratory Devices	Introduction in Biomedical	6

			Engineering	
2.7	RADEQE8	Radiological Equipments	Introduction in Biomedical Engineering	7
2.8	QMNGME8	Quality Management of Medical Technology Products	Fundamentals of Medical Electronics	7
2.9	CLNPRE8	Clinical Practice	Medical Instrumentation Systems	15
			Total 60 credits	

Free Components

3.1	BIOSTE8	Biostatistics	Discrete Mathematics	10
3.2	MDEXPE8	Medical Expert Systems	Don't have	6
3.3	PRGVSE8	Programming in Visual Studio	Algorithmization Fundamentals and Programming Elements	6
3.4	HADMME8	Hospital Administration And Management	Don't have	10
3.5	ARORGE8	Artificial Organs	Don't have	6
3.6	TLMEDE8	Telemedicine	Don't have	6
3.7	DMEDSE8	Distance Medical Systems	Don't have	6
3.8	MEDINSE8	Medical Information Systems	Don't have	5
3.9	MDSENE8	Medical Sensors	Don't have	5

Map of study results

Nº	Course code	Course	General and technical competencies					
			Knowledge and understanding	Applying knowledge	Making judgments	Communication skills	Learning skills	Values
1	MAT01E8	Mathematics 1	x	x			x	
2	PHY01E8	Physics 1	x	x			x	
3	ECGRPE8	Engineering Computer Graphics	x	x				
4	IIT01E8	Introduction in Information Technologies		x		x	x	

№	Course code	Course	General and technical competencies					
			Knowledge and understanding	Applying knowledge	Making judgments	Communication skills	Learning skills	Values
5	FUCAOE8	Fundamentals of Computer Architecture and Organization	x	x			x	
s6	IBMDEE8	Introduction in Biomedical Engineering	x	x	x			
7	MAT02E8	Mathematics 2	x	x			x	
8	PHY02E8	Physics2		x	x		x	
9	MINSSE8	Medical Instrumentation Systems	x	x	x			
10	MCHHBE8	Mechanics of Human Body	x	x	x			
11	AFPREE8	Algorithmization Fundamentals and Programming Elements		x	x		x	
12	BPHYSE8	Biophysics	x	x	x			
13	DIMATE8	Discrete Mathematics		x	x		x	
14	PHY03E8	Physics 3	x	x			x	
15	ELMSRE8	Electrical Measurements	x	x				
16	FMEDLE8	Fundamentals of Medical Electronics	x	x				
17	OOP01E8	Object-Oriented Programming		x			x	
18	ELPHSE8	Electrophysiology	x	x				
19	HPSHLE8	Human Physiology	x	x			x	
20	MELWSE8	Modeling in Electronic Workbench Space	x	x				
21	MTRMDE8	Materials for Medical Devices	x	x	x			
22	ENMDTE8	Elements and Nodes of Medical Technics	x	x				
23	BUSCOE8	Business Correspondence		x		x		x
24	CABMEE8	CAD Systems	x	x				
25	LVPRME8	Lab View Programming Methods	x	x			x	
26	BMDMSE8	Biomedical Measuring	x	x				
27	MEDELE8	Medical Electronics	x	x				
28	BMDTRE8	Biomedical Transducers	x	x				
29	BBMSPE8	Basis Of Biomedical Signal Processing	x	x				
30	CTSYSE8	Control Systems In Medicine	x	x				
31	BMDEQE8	Biomedical Equipments	x	x	x			
32	MDEXPE8	Biomedical Equipment Service	x	x				
33	BMNTPE8	Team Project in Biomedical Engineering		x		x		
34	BINFME8	Bioinformatics in MATLAB	x	x				
35	MPMSSE8	Microprocessor Medical Systems	x	x				
36	MMBMSE8	Mathematical modeling of biomedical systems	x	x				
37	HLINSE8	Health Information Systems	x		x	x		

Nº	Course code	Course	General and technical competencies						
			Knowledge and understanding	Applying knowledge	Making judgments	Communication skills	Learning skills	Values	
38	MBHLTE8	Mobile Health	x	x					
39	INF MSE8	Interfaces of Medical Systems	x	x					
40	CDLDVE8	Clinical Diagnostic Laboratory Devices	x	x					
41	RADEQE8	Radiological Equipments	x	x					
42	QMNGME8	Quality Management of Medical Devices	x	x					
43	CLNPRE8	Clinical Practice		x		x			
44	BIOSTE8	Biostatistics	x	x					
45	MDEXPE8	Medical Expert Systems	x	x					
46	PRGVSE8	Programming in Visual Studio	x	x					
47	HADMME8	Hospital Administration And Management	x	x		x			
48	ARORGE8	Artificial Organs	x	x					
49	TLMEDE8	Telemedicine	x	x					
50	DMEDSE8	Distance Medical Systems	x	x	x				
51	MEDINSE8	Medical Information Systems	x	x	x				
52	MDSENE8	Medical Sensors	x	x	x				

Program Curriculum

Nº	Course code	Course	Hours	ECTS Credit\ Hour	Lecture	Seminar (group work)	Practical Work	Laboratory Work	Practice	Course Work/Project	Independent Work	Intermediary assessment Exams
1	MAT01E8	Mathematics 1		5/135	30		30				69	4 2
2	PHY01E8	Physics 1		4/108	15			30			57	4 2
3	ECGRPE8	Engineering Computer Graphics		5/135			30	30			69	4 2
4	IIT01E8	Introduction in Information Technologies		5/135	15		15	30			69	4 2
5	FUCAOE8	Fundamentals of Computer Architecture and Organization		4/108	15		30				57	4 2
6	IBMDEE8	Introduction in Biomedical Engineering		7/189	45		45				93	4 2

№	Course code	Course	Hours										
			ECTS Credit\ Hour	Lecture	Seminar (group work)	Practical Work	Laboratory Work	Practice	Course Work/Project	Independent Work	Intermediary assessment	Exams	
7	MAT02E8	Mathematics 2	5/135	30		30					69	4	2
8	PHY02E8	Physics2	4/108	15			30				57	4	2
9	MINSSE8	Medical Instrumentation Systems	5/135	30		30					69	4	2
10	MCHHBE8	Mechanics of Human Body	5/135	30		30					69	4	2
11	AFPREE8	Algorithmization Fundamentals and Programming Elements	6/162	15		30	30				81	4	2
12	BPHYSE8	Biophysics	5/135	30		30					69	4	2
13	DIMATE8	Discrete Mathematics	5/135	30		30					69	4	2
14	PHY03E8	Physics 3	4/108	15			30				57	4	2
15	ELMSRE8	Electrical Measurements	5/135	30			30				69	4	2
16	FMEDLE8	Fundamentals of Medical Electronics	6/162	30		45					81	4	2
17	OOP01E8	Object-Oriented Programming	5/135	15		15	30				69	4	2
18	ELPHSE8	Electrophysiology	5/135	30	30						69	4	2
19	HPSHLE8	Human Physiology	5/135	30			30				69	4	2
20	MELWSE8	Modeling in Electronic Workbench Space	6/162			30	45				81	4	2
21	MTRMDE8	Materials for Medical Devices	5/135	30	30						69	4	2
22	ENMDTE8	Elements and Nodes of Medical Technics	6/162	30		45					81	4	2
23	BUSCOE8	Business Correspondence	3/81			30					45	4	2
24	CABMEE8	CAD Systems	5/135			30	30				69	4	2
25	LVPRME8	Lab View Programming Methods	5/135			30	30				69	4	2
26	BMDMSE8	Biomedical Measuring	5/135	30			30				69	4	2
27	MEDELE8	Medical Electronics	5/135	30		30					69	4	2
28	BMDTRE8	Biomedical Transducers	5/135	30			30				69	4	2
29	BBMSPE8	Basis Of Biomedical Signal Processing	10/270	60		60					144	4	2
30	CTSYSE8	Control Systems In Medicine	5/135	30		30					69	4	2
31	BMDEQE8	Biomedical Equipments	5/135	30			30				69	4	2
32	BMDESE8	Biomedical Equipment Service	5/135			60					69	4	2
33	BMNTPE8	Team Project in Biomedical Engineering	10/270						120		144	4	2
34	BINFME8	Bioinformatics in MATLAB	5/135	30			30				69	4	2
35	MPMSSE8	Microprocessor Medical Systems	5/135	30		30					69	4	2
36	MMBMSE8	Mathematical modeling of Biomedical systems	5/135	30		30					69	4	2
37	HLINSE8	Health Information Systems	5/135	30		30					69	4	2
38	MBHLTE8	Mobile Health	5/135	30	30						69	4	2

№	Course code	Course	Hours										
			ECTS Credit\ Hour	Lecture	Seminar (group work)	Practical Work	Laboratory Work	Practice	Course Work/Project	Independent Work	Intermediary assessment	Exams	
39	INFMSE8	Interfaces of Medical Systems	5/135	30		30					69	4	2
40	CDLDVE8	Clinical Diagnostic Laboratory Devices	6/162	30		45					81	4	2
41	RADEQE8	Radiological Equipments	7/189	45		45					93	4	2
42	QMNGME8	Quality Management of Medical Technology Products	7/189	45		45					93	4	2
43	CLNPRE8	Clinical Practice	15/270						180		219	4	2
44	BIOSTS8	Biostatistics	10/270	60		60					144	4	2
45	MDEXPE8	Medical Expert Systems	6/162	30	45						81	4	2
46	PRGVSE8	Programming in Visual Studio	6/162				75				81	4	2
47	HADMMME8	Hospital Administration And Management	10/270	30					90		144	4	2
48	ARORGE8	Artificial Organs	6/162	30	45						81	4	2
49	TLMEDE8	Telemedicine	6/162	30	45						81	4	2
50	DMEDSE8	Distance Medical Systems	6/162	30	45						81	4	2
51	MEDINSE8	Medical Information Systems	5/135	30	45	30					69	4	2
52	MDSENE8	Medical Sensors	5/135	30		30					69	4	2

Educational Program Supervisor

Irina Gotsiridze

The Head of Quality Assurance Service at the Faculty of Informatics and Control Systems

Zurab Baiashvili

The Dean of Faculty

Zurab Tsveraidze

Accepted at

The Council of the Faculty Informatics and Control Systems

25.04. 2013

Protocol № 1

For the purpose of modification, the project for representation in Faculty Council is prepared