



საქართველოს ტექნიკური უნივერსიტეტი
GEORGIAN TECHNICAL UNIVERSITY

Approved by Academic Council of GTU on
“ ___ ” “ ” 2013
by Decree №

Bachelor's Degree Program

Program Title

Biomedical Engineering

Faculty

Informatics and Control Systems

Program Supervisor

Full Professor Irina Gotsiridze

Awarded Qualification

Bachelor of Biomedical Engineering

Will be awarded in the case of passing not less than 240 credits of an educational program.

Language

English

Program Objective

The program educational objectives of biomedical engineering program is to integrate engineering and life science principles into a comprehensive curriculum, that prepares students for entry into the master program, biomedical industry, or professional school. Primary research areas are biomedical imaging, biomedical implants and devices, cardiac electrophysiology, multiscale computational modeling, tissue engineering and regenerative medicine. Program provide graduates with a rigorous, broad-based education in engineering coupled with applied biology that will prepare bachelors for the many diverse career opportunities of biomedical engineering. Provide an empowering professional degree for students who intend to become practicing engineers .

Program prerequisites

Applicant is admitted in compliance with the Georgian Legislation

Learning Outcome/Competencies

– **Knowledge and understanding:** Deep knowledge of the field of Biomedical Engineering, critical understanding of theories and principles, understanding of field's complex issues; Develop a through understanding of advanced principles in Biomedical Engineering. Awareness of current and leading-edge topics in Biomedical Engineering. To understand the biological bases of the assessments routinely performed by Biomedical Engineers;

– **Applying Knowledge:** Using of the specific for the field of Biomedical Engineering problem-solving methods; 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, 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 design a system, component, or process to meet desired needs. An ability to identify, formulate, and solve engineering problems . An ability to make measurements on and interpret data from living systems, addressing the problems associated with the interaction between living and non-living materials and systems. A knowledge of biology and physiology . Clear public presentation of opinions in accordance with corresponding knowledge and logic for professional and general audience. An ability to use the techniques, skills, and modern engineering and computing tools necessary for engineering practice . An ability to function on multi-disciplinary teams . The capability to apply advanced mathematics (including differential equations and statistics), science, and engineering to solve the problems at the interface of engineering and biology. 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 global and societal context , also analysis of abstract data and/or situations analysis by the mean of standard and some distinctive methods and form of the reasoned conclusions on their basis;

– **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 in foreign languages; Creative use of modern engineering, information and communication technologies; Skill to communicate in native and foreign languages;

– **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.

– **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

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 equipment, such as heart valves and artificial limbs as well as contribute to develop various medical devices such as heart pacemakers. 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.

Possibilities for further continues education

Master 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: 56

№	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	3			
4	IIT01E8	Introduction in Information Technologies	Don't have	5			
5	FUCAOE8	Fundamentals of Computer Architecture and Organization	Don't have	4			
6	BIMCHE8	Biomechanics	Don't have	4			
7	IBMDEE8	Introduction in Biomedical Engineering	Don't have	5			
8	MAT02E8	Mathematics 2	Don't have		5		
9	PHY02E8	Physics 2	Don't have		4		
10	BBINSE8	Basis of Bioinstrumentation	Don't have		5		
11	PAS02E8	Personal Application Systems	Don't have		4		
12	MMEDRE8	Methods Of Medical Researches	Don't have		4		
13	DSTAPE8	Data Structures and Programming	Don't have		4		

Nº	Course Code	Course	Prerequisite	ECTS CREDITS			
				1 year		II year	
				Semester			
I	II	III	IV				
14	BPHYSE8	Biophysics	Don't have		4		
15	DIMATE8	Discrete Mathematics	Don't have			5	
16	PHY03E8	Physics 3	Don't have			5	
17	ELMSRE8	Electrical Measurements	Don't have			5	
18	FMEDLE8	Fundamentals of Medical Electronics	Don't have			5	
19	OOP01E8	Object-Oriented Programming	Don't have			5	
20	ELPHSE8	Electrophysiology	Don't have			5	
21	HPSHLE8	Human Physiology	Don't have				5
22	MELWSE8	Modeling in Electronic Workbench Space	Don't have				6
23	BMTRLE8	Biomaterials	Don't have				5
24	ENMDTE8	Elements and Nodes of Medical Technics	Don't have				6
25	BUSCOE8	Business Correspondence	Don't have				3
26	CABMEE8	CAD Systems	Don't have				5

MODULE 1 Medical Technics and Technologies

Nº	CODES	DISCIPLINE	Prerequisite	ECTS Credits
1.1	LVPRME8	Lab View Programming Methods	Don't have	4
1.2	SSFPME8	Software Systems for Project Management	Don't have	4
1.3	BMDMSE8	Biomedical Measuring	Don't have	4
1.4	MEDELE8	Medical Electronics	Don't have	4
1.5	BMDTRE8	Biomedical Transducers	Don't have	4
1.6	BBMSPE8	Basis Of Biomedical Signal Processing	Don't have	4
1.7	BDPBSE8	Basis Of Digital Processing of Biomedical Signals	Don't have	4
1.8	CTSYSE8	Control Systems in Medicine	Don't have	4
1.9	BMDEQE8	Biomedical Equipments	Don't have	5
1.10	BMDESE8	Biomedical Equipment Service	Don't have	4
1.11	BIOSTE8	Biostatistics	Don't have	4
1.12	MDEXPE8	Medical Expert Systems	Don't have	5
1.13	BMNTPE8	Team Project in Biomedical Engineering	Don't have	4
1.14	BINFME8	Bioinformatics in MATLAB	Don't have	3
1.15	PRGVSE8	Programming in Visual Studio	Don't have	3
	Total			60 credits

Module II Medical Compute Systems

Nº	CODES	DISCIPLINE	Prerequisite	ECTS CREDITS
2.1	MDSYSE8	Medical Diagnostic Systems	Don't have	5
2.2	MPMSSE8	Microprocessor Medical Systems	Don't have	4
2.3	BMIMPE8	Basis of Medical Image Processing	Don't have	4
2.4	BCENGE8	Basis of Clinical Engineering	Don't have	4
2.5	MMBMSE8	Mathematical modeling of Biomedical Systems	Don't have	4
2.6	BMINFE8	Basis of Medical Informatics	Don't have	4
2.7	MBHLTE8	Mobile Health	Don't have	4
2.8	INFMSE8	Interfaces of Medical Systems	Don't have	4
2.9	ARORGE8	Artificial Organs	Don't have	3
2.10	CDLDVE8	Clinical Diagnostic Laboratory Devices	Don't have	5
2.11	RADDVE8	Radiological Devices	Don't have	4
2.12	HCMNGE8	Health Care Management	Don't have	4
2.13	TLMEDE8	Telemedicine	Don't have	3
2.14	QMNGME8	Quality Management of Medical Technology Products	Don't have	4
2.15	CLNPRE8	Clinical Practice	Don't have	4
			Total 60 credits	

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	x	
5	FUCAOE8	Fundamentals of Computer Architecture and Organization	x	x			x	
6	BIMCHE8	Biomechanics	x	x	x			
7	IBMDEE8	Introduction in Biomedical Engineering	x	x	x			
8	MAT02E8	Mathematics 2	x	x			x	
9	PHY02E8	Physics 2		x	x		x	
10	BBINSE8	Basics of Bioinstrumentation	x	x	x			

№	Course code	Course	General and technical competencies					
			Knowledge and understanding	Applying knowledge	Making judgments	Communication skills	Learning skills	Values
11	PAS02E8	Personal Application Systems		x		x	x	
12	MMEDRE8	Methods Of Medical Research	x	x	x			
13	DSTAPE8	Data Structures and Programming		x	x		x	
14	BPHYSE8	Biophysics	x	x	x			
15	DIMATE8	Discrete Mathematics		x	x		x	
16	PHY03E8	Physics 3	x	x			x	
17	ELMSRE8	Electrical Measurements	x	x				
18	FMEDLE8	Fundamentals of Medical Electronics	x	x				
19	OOP01E8	Object-Oriented Programming		x				x
20	ELPHSE8	Electrophysiology	x	x				
21	HPSHLE8	Human Physiology	x	x			x	
22	MELWSE8	Modeling in Electronic Workbench Space	x	x				
23	BMTRLE8	Biomaterials	x	x	x			
24	ENMDTE8	Elements and Nodes of Medical Technics	x	x				
25	BUSCOE8	Business Correspondence		x		x		x
26	CABMEE8	CAD Systems	x	x				
27	LVPRME8	Lab View Programming Methods	x	x			x	
28	SSFPME8	Software Systems for Project Management	x	x			x	
29	BMDMSE8	Biomedical Measurements	x	x				
30	MEDELE8	Medical Electronics	x	x				
31	BMDTRE8	Biomedical Transducers	x	x				
32	BBMSPE8	Basis Of Biomedical Signal Processing	x	x				
33	BDPBSE8	Basis Of Digital Processing of Biomedical Signals	x	x				
34	CTSYSE8	Control Systems In Medicine	x	x				
35	BMDEQE8	Biomedical Equipments	x	x	x			
36	MDEXPE8	Biomedical Equipment Service	x	x				
37	BIOSTE8	Biostatistics	x	x				
38	MDEXPE8	Medical Expert Systems	x	x				
39	BMNTPE8	Team Project in Biomedical Engineering		x		x		
40	BINFME8	Bioinformatics in MATLAB	x	x				
41	PRGVSE8	Programming in Visual Studio	x	x				
42	MDSYSE8	Medical Diagnostic Systems	x	x				
43	MPMSSE8	Microprocessor Medical Systems	x	x				
44	BMIMPE8	Basis of Medical Image Processing	x	x	x			
45	BCENGE8	Basis of Clinical Engineering	x	x		x		
46	MMBMSE8	Mathematical modeling of biomedical systems	x	x				

№	Course code	Course	General and technical competencies					
			Knowledge and understanding	Applying knowledge	Making judgments	Communication skills	Learning skills	Values
47	BMINFE8	Basis of Medical Informatics	x		x	x		
48	MBHLTE8	Mobile Health	x	x				
49	INFMSE8	Interfaces of Medical Systems	x	x				
50	ARORGE8	Artificial Organs	x	x				
51	CDLDVE8	Clinical Diagnostic Laboratory Devices	x	x				
52	RADDVE8	Radiological Devices	x	x				
53	HCMNGE8	Health Care Management	x		x			
54	TLMEDE8	Telemedicine	x	x				
55	QMNGME8	Quality Management of Medical Devices	x	x				
56	CLNPRE8	Clinical Practice		x		x		

Program Curriculum

№	Course code	Course	Hours							
			ECTS Credit\ Hour	Lecture	Seminar (group work)	Practical Work	Laboratory Work	Practice	Course Work/Project	Independent Work
1	MAT01E8	Mathematics 1	5/135	30		30				75
2	PHY01E8	Physics 1	4/108	15			30			63
3	ECGRPE8	Engineering Computer Graphics	3/81			15	30			51
4	IIT01E8	Introduction in Information Technologies	5/135	15		15	30			75
5	FUCAOE8	Fundamentals of Computer Architecture and Organization	4/108	30		15				63
6	BIMCHE8	Biomechanics	4/108	15		30				63
7	IBMDEE8	Introduction in Biomedical Engineering	5/135	30		30				75
8	MAT02E8	Mathematics 2	5/135	30		30				75
9	PHY02E8	Physics 2	4/108	15			30			63
10	BBINSE8	Basis of Bioinstrumentation	5/135	30		30				75
11	PAS02E8	Personal Application Systems	4/108	15		30				63
12	MMEDRE8	Methods Of Medical Research	4/108	15			30			63
13	DSTAPE8	Data Structures and Programming	4/108	15		30				63

№	Course code	Course	Hours							
			ECTS Credit\ Hour	Lecture	Seminar (group work)	Practical Work	Laboratory Work	Practice	Course Work/Project	Independent Work
14	BPHYSE8	Biophysics	4/108	30		15				63
15	DIMATE8	Discrete Mathematics	5/135	30		30				75
16	PHY03E8	Physics 3	5/135	30			30			75
17	ELMSRE8	Electrical Measurements	5/135	30			30			75
18	FMEDLE8	Fundamentals of Medical Electronics	5/135	30		30				75
19	OOP01E8	Object-Oriented Programming	5/135	15		15	30			75
20	ELPHSE8	Electrophysiology	5/135	30	30					75
21	HPSHLE8	Human Physiology	5/135	30			30			75
22	MELWSE8	Modeling in Electronic Workbench Space	6/162			30	45			87
23	BMTRLE8	Biomaterials	5/135	30	30					75
24	ENMDTE8	Elements and Nodes of Medical Technics	6/162	30		45				87
25	BUSCOE8	Business Correspondence	3/81			30				51
26	CABMEE8	CAD Systems	5/135			30	30			75
27	LVPRME8	Lab View Programming Methods	4/108		15	30				63
28	SSFPME8	Software Systems for Project Management	4/108		15	30				63
29	BMDMSE8	Biomedical Measurements	4/108	15			30			63
30	MEDELE8	Medical Electronics	4/108	15		30				63
31	BMDTRE8	Biomedical Transducers	4/108	15		30				63
32	BBMSPE8	Basis Of Biomedical Signal Processing	4/108	30		15				63
33	BDPBSE8	Basis Of Digital Processing of Biomedical Signals	4/108	30		15				63
34	CTSYSE8	Control Systems In Medicine	4/108	30		15				63
35	BMDEQE8	Biomedical Equipments	5/135	30		30				75
36	BMDESE8	Biomedical Equipment Service	4/108			45				63
37	BIOSTS8	Biostatistics	4/108	15					30	63
38	MDEXPE8	Medical Expert Systems	5/135	30	30					75
39	BMNTPE8	Team Project in Biomedical Engineering	4/108						45	63
40	BINFME8	Bioinformatics in MATLAB	3/81			30				51
41	PRGVSE8	Programming in Visual Studio	3/81				30			51
42	MDSYSE8	Medical Diagnostic Systems	5/135	30		30				75
43	MPMSSE8	Microprocessor Medical Systems	4/108	30		30				63
44	BMIMPE8	Basis of Medical Image Processing	4/108	15					30	63
45	BCENGE8	Basis of Clinical Engineering	4/108	15				30		63
46	MMBMSE8	Mathematical modeling of Biomedical systems	4/108	30		15				63

Nº	Course code	Course	Hours	ECTS Credit\ Hour	Lecture	Seminar (group work)	Practical Work	Laboratory Work	Practice	Course Work/Project	Independent Work
47	BMINFE8	Basis of Medical Informatics		4/108	30		15				63
48	MBHLTE8	Mobile Health		4/108	30	15					63
49	INFMSE8	Interfaces of Medical Systems		4/108	30		15				63
50	ARORGE8	Artificial Organs		3/81	45						51
51	CDLDVE8	Clinical Diagnostic Laboratory Devices		5/165	30		30				75
52	RADDVE8	Radiological Devices		4/108	30		15				63
53	HCMNGE8	Health Care Management		4/108	15	30					63
54	TLMEDE8	Telemedicine		3/1/81	30						51
55	QMNGME8	Quality Management of Medical Technology Products		4/108	15		30				63
56	CLNPRE8	Clinical Practice		4/108					45		63

Educational Program Supervisor

Irina Gotsiridze

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

Zurab Baiashvili

Accepted at

The Council of the Faculty
Informatics and Control Systems

03.04. 2013

Protocol Nº 1

The Head of the Faculty Council

Zurab Tsveraidze

Agreed with

Quality Assurance Service of GTU

Giorgi Dziridzuri