საქართველოს ტექნიკური უნივერსიტეტი
GEORGIAN TECHNICAL UNIVERSITY

Approved by
Resolution № 733 of the Academic Council of GTU dated July 06, 2012

Amended by
Resolution № 01-05-04/200 of the Academic Council of GTU dated December 20, 2021

Bachelor's Educational Program

Program Title

ციფრული სატელეკომუნიკაციო ტექნოლოგიები
Digital telecommunication technologies

Faculty

ინფორმატიკისა და მართვის სისტემების ფაკულტეტი
Faculty of informatics and control systems

Program Head/Heads

Associate Professor Shalva KVIRKVELIA

Qualification to be Awarded and the Extent of the Program in terms of Credits

Bachelor of Engineering in Telecommunications The qualification will be awarded by combining 232 credits in the program and 8 credits of free components, if at least 240 credits are completed.

Teaching Language

Georgian

Prerequisite for Admission to the Program

Only the holder of a state certificate proving complete general education, or an equivalent person enrolled in accordance with the procedure established by Georgia law, shall have the right to study at the Bachelor's Educational Program of “Digital telecommunication technologies”.

Program Description

New trends in the development of society - globalization, development of information technologies, requirements for the speed of information delivery and the growth of modern means of communication have increased the demand for the field of telecommunications, which adds more relevance to the presented Bachelor's Educational Program.

During the preparation of the program, the experience of several leading universities in the world in implementing similar programs was studied and analyzed, namely:

1. Georgia Institute of Technology, USA. Bachelor's degree in electrical engineering (in the direction of telecommunications), capacity 240 credits.

https://www.ece.gatech.edu/electrical-engineering-degree

2. University of Catalonia, Spain, Bachelor's Degree in Telecommunications Technologies and Services Engineering, capacity 240 credits.
https://telecos.upc.edu/en/study-programs/degrees/bachelors-degree-in-telecommunications-technologies-and-services-engineering

3. Royal Institute of Technology Melbourne, Australia, Bachelor of Engineering in Telecommunications, capacity 240 credits.
https://www.rmit.edu.au/study-with-us/levels-of-study/undergraduate-study/honours-degrees/bachelor-of-engineering-telecommunications-engineering-honours-bh071/bh071p17auscy

4. Riga Institute of Transport and Telecommunications, Latvia, Bachelor of Engineering Sciences in Telecommunication Systems and Computer Networks, capacity 240 credits.
http://www.tsi.lv/ru/content/telekommunikacionnye-sistemy-i-kompyuternye-seti

The program is compiled by the European Credit Transfer and Accumulation System (ECTS). At the Georgian Technical University, 1 credit is equal to 25 hours, which includes both contact and independent work hours. The distribution of credits according to subjects is presented in the curriculum. The program lasts 4 years (8 semesters, 60 credits per year) and includes a total of 240 credits. The content, teaching forms, methods and number of credits of the education course program (syllabus) ensure the achievement of the goal of the Bachelor's program.

Program structure

The program consists of 232 credits of education courses corresponding to the main field of education of which 172 credits are compulsory components, 60 credits of elective components - including concentration and 8 credits of elective free components.

The program includes 4 elective concentrations. The capacity of each concentration, including the Bachelor's thesis, is 25 credits in total.

Organization of the educational process, assessment of student achievements, educational and financial agreements with students, accumulation of credits by the student, and other necessary information are provided in the "Instructions for managing the educational process of the Georgian Technical University", placed on the website of GTU.

Program Objective

- To prepare qualified staff with extensive knowledge of existing technological systems and technical means, the theory of construction of electronic devices, design, principles of operation and operation rules for the free labor market in the field of modern digital telecommunications;
- To develop the skills of the bachelor in the wise operation, development, monitoring and maintenance of existing telecommunication systems and networks, as well as in the use of new technologies and types of services determined by the world trends of telecommunication development;
- To provide graduates with professional and general (transferable) competences, which will determine not only their employment prospects with the Bachelor of Engineering qualification in telecommunications, but also motivate them to continue their studies and deepen their professional competence.

Learning Outcomes/Competences (general and professional)

Bachelor of Engineering in Telecommunications:

1. **Describes** the theories and principles used in the field of telecommunications, makes a critical understanding of them;
2. **Analyzes** the complex issues of telecommunication theory and techniques and determined by the main trends in the development of the field;
3. **Performs** schematic and technical design, calculation and construction of switching nodes using appropriate documentary material;
4. **Operate**s and **monitors** power supply devices for telecommunication equipment in accordance with the rules and recommendations for the operation of these devices;
5. In a complex, unpredictable environment, in accordance with the task, **carries out** professional activities in an organized manner in compliance with the norms of ethics, observes the requirements established for the operation of telecommunications facilities, applicable norms, rules and standards;
6. **Conducts** measurements of the characteristics of telecommunication devices, channels and tracts and analyzes the results;
7. **Uses** computer programs at different stages of designing, installing, setting up and operating individual nodes, systems, networks of telecommunication devices;
8. **Gets informed** about the possibilities of new telecommunication methods, systems, networks, services;
9. Independently and conscientiously **establishes** his further professional growth and development program.

Concentration 1

- Describes modern digital telecommunication technologies theoretically and demonstrates a broad knowledge of cellular mobile network, Internet of Things network, sensors and control units;
- Builds the cellular mobile connection network, organizes the Internet of Things network, sensors, control units and connects the network components to each other.
- Creates a research and/or practical cellular network project and optimizes network parameters in accordance with predetermined guidelines.
- Uses cognitive radio technologies, integrates it with the network.
- Serves cellular mobile connection systems responsibly and in full compliance with ethical norms.

Concentration 2

- Describes modern digital telecommunications technology systems and demonstrates a broad knowledge of signals, source coding, processing and effective coding techniques.
- Uses, transmits, receives and processes sound information in accordance with predetermined instructions, creates a project of research and/or practical universal information and communication infrastructure based on modern technologies and optimizes parameters.
- Serves multi-service and information communication networks.
- Develops signal-code constructions and feedback circuits in accordance with the guidelines for telecommunication systems.
- Serves telecommunication technology systems and networks with responsibility and full compliance with ethical norms.

Concentration 3

- Describes modern digital telecommunication technology systems and demonstrates a broad knowledge of optical transport systems application methods.
- Transmits, receives and processes information through an optical network.
- In accordance with the predetermined guidelines, creates the project of cable systems and networks of a research and/or practical nature, optimizes parameters, and models optical systems.
- Builds and maintains a DWDM network;
- Serves optical transport systems responsibly and in full compliance with ethical norms.

Concentration 4

- Describes radio communication, terrestrial and satellite modern telecommunication systems;
- Demonstrates broad knowledge of radiolocation and radionavigation systems;
- Performs computer modeling of research and/or practical antennas in accordance with predetermined guidelines;
- Builds radio frequency circuits and works with signal processors;
- Serves high-frequency devices responsibly and in full compliance with ethical norms.

Methods of achieving learning outcomes (teaching-learning)

☒ Lecture ☒ Seminar (group work) ☒ Practical ☒ Laboratory
☒ Practice ☒ Course work/Project ☒ Consultation ☒ Independent work

In the educational process, depending on the specifics of a particular study course program, the following teaching-learning methods are used, which are given in the relevant education course programs (syllabi): Discussion/debate, cooperative learning, group(collaborative)work, case study, brain storming, demonstration, inductive, deductive, analysis, synthesis, verbal, written work, explanatory, action-oriented learning, project development and presentation

Detailed information on teaching-learning methods and relevant activities is provided on the web page of GTU.

Student's Knowledge Assessment System

The student's knowledge is assessed on a 100-point scale.

Positive grades are:

- (A)-Excellent - 91-100 points;
- (B)-Very Good – 81-90 points;
- (C)-Good – 71-80 points;
- (D)-Satisfactory – 61-70 points;
- (E)-Sufficient – 51-60 points.

Negative grades are:

- (FX) - Failed to pass – 41-50 points, which means that the student needs more work to pass and is allowed to take an additional exam once with independent work;
- (F) - Failed - 40 points or less, which means that the work done by the student is insufficient and he/she will have to study the subject again.

In case of FX, an additional exam is held, not less than 5 days after the announcement of the results. The mark obtained in the additional exam is not added to the mark obtained in the final assessment
Detailed information is provided on the GTU website: Instruction for managing the educational process at the Georgian Technical University.

Fields of Employment

Public and corporate telephone networks; cellular, mobile, internet and fiber optic networks; radio communication, radio broadcasting and television companies; Terrestrial and satellite communication facilities; International and long-distance communication companies, cable television; Processing of telecommunication equipment, components, systems - creation and production facilities.

Opportunities for continuing education

Master's degree educational programs

Human and material resources needed to implement the program

The program is provided with adequate human and material resources. For additional information, please find the attached documentation.

Number of attached syllabi: 102

Curriculum of the program

№	Subject code	Subject	Hours									
			ECTS credits/hours	Lecture	Seminar (group work)	Practical	Laboratory	Practice	Course work/Project	Mid-semester exam	Final exam	Independent work
1	MAS33508G1-LP	Engineering mathematics 1	5/125	15		30				1	2	77
2	PHS51208G1-LB	General physics A	4/100	15			15			1	2	67
3	ICT10408G1-LP	Basics of programming (based on C++ language)	5/125	30		15				1	2	77
4	EET50708G2-LPB	Introduction to the specialty	5/125	15		15	14			1	1	79
5	ICT12908G4-LP	Computer architecture and organization	3/75	15		15				1	2	42
6	LEH15012G3-P	English language-1	5/125			45				1	1	78
7	MAS33608G1-LP	Engineering mathematics 2	5/125	15		30				1	2	77
8	PHS51308G1-LB	General physics B	4/100	15			15			1	2	67
9	LEH15112G3-P	English language - 2	5/125			45				1	1	78
10	EET56802G1-LB	Analysis of electrical circuits 1	5/125	15			30			1	1	78
11	ICT13008G4-LP	computer operating systems	3/75	6		24				1	2	42
12	ICT13108G4-LP	Network technology and communication	3/75	15		15				1	2	43
13	MAS33708G1-LP	Engineering mathematics 3	5/125	15		30				1	2	77
14	LEH15212G3-P	English language - 3	5/125			45				1	1	78
15	MAS31608G1-LP	Probability theory and mathematical statistics	4/100	15		15				1	2	67
16	EET47902G3-LB	Analysis of electrical circuits 2	3/75	15			15			1	1	43
17	EET50908G2-LB	Basics of radio electronics	3/75	15			15			1	1	43
18	EET52008G3-LP	Basics of digital techniques	3/75	15		15				1	1	43
19	EET51408G2-PB	Telecommunication technologies	4/100			15	30			1	2	52
20	BUA35808G2-LS	Fundamentals of management	3/75	15	15					1	1	43
21	LEH15312G3-P	English language - 4	5/125			45				1	1	78
22	EET51008G2-LPB	Theory of signals and reception methods	5/125	15		15	30			1	1	63
23	EET51108G2-LB	Telecommunication theory	4/100	15			30			1	1	53
24	EET51308G2-LBK	Fundamentals of information and coding theory	5/125	15			30		15	1	1	53

25	EET51608G2-LB	Software tools for modeling telecommunication systems	4/100	15			30			1	1	53
26	EET51508G2-LPB	Basics of building telecommunication networks	4/100	15		15	15			1	1	53
27	HHS20803G1-LB	Fundamentals of labor protection in energy and telecommunications	3/75	15			15			1	1	43
28	EET52708G2-LPB	Electrodynamics	5/125	15		15	15			1	1	78
29	EET52208G2-LBK	Theory of teletraffic	5/125	15			15		15	1	1	78
30	EET52408G2-LPB	Switching in modern telecommunication networks	5/125	15		15	15			1	1	78
31	EET52608G2-LBK	Telecommunication cable lines	5/125	15			15		15	1	1	78
32	EET52508G2-LPB	Fundamentals of building telecommunication systems	5/125	15		15	15			1	1	78
33.1	EET57508G2-LS	Basic principles of management of telecommunications companies	5/125	15	30					1	1	78
33.2	EET56708G2-LS	Engineering management	5/125	15	30					1	1	78
34	EET52808G2-LBKR	Telecommunication systems	5/125	15			7	15	8	1	1	78
35	EET52308G2-LPBR	Digital telecommunication networks	5/125	15		7	8	15		1	1	78
36	EET53008G2-LPR	Digital telecommunication	5/125	15		15		15		1	1	78
37	EET57108G2-LPB	Measurements in telecommunication equipment	5/125	15		15	15			1	1	78
38.1	EET52108G2-LPKR	Propagation of radio waves and antennas	5/125	15		7		15	8	1	1	78
38.2	EET57008G2-LP	Models of radio communication channels	5/125	15		30				1	1	78
39.1	EET51908G2-LSR	Economics of Telecommunications	5/125	15	15			15		1	1	78
39.2	EET54508G2-LS	Mathematical foundations of financial management	5/125	15	30					1	1	78
39.3	EET55908G2-LSK	Quality management of telecommunications companies	5/125	15	15				15	1	1	78
40	EET55808G2-LPK	Digital fiber-optic transmission systems and technologies	5/125	15		15			15	1	1	78

41	EET53508G2-LPB	Basics of building cellular mobile connection networks	5/125	15		15	15			1	1	78
42.1	BUA40208G2-LS	Project management	5/125	15	15			15		1	1	78
42.2	SOS58508G1-LS	Economic analysis of companies' activities	5/125	15	15			15		1	1	78
43.1	EET54308G2-LPB	Information transmission technologies with Internet protocol	5/125	15		15	15			1	1	78
43.2	EET54208G2-LPB	IP - technology and NGN networks	5/125	15		15	15			1	1	78
44.1	EET55508G2-LPK	Computer engineering of digital telecommunication systems	5/525	15		15			15	1	1	78
44.2	EET54808G2-LSP	Information communication network software and	5/125	15	15	15				1	1	78
44.3	EET58608G2-LS	Basics of management	5/125	15	30					1	1	78
44.4	EET59408G2-LSP	Fundamentals of information security and safety in telecommunications	5/125	15	15	15				1	1	78
44.5	EET56208G2-LP	Reference models and network addressing	5/125	15		30				1	1	78
45.1	EET56808G2-LPB	Mobile connection	5/125	15		15	15			1	1	78
45.2	EET59208G2-LPB	Analog and digital television	5/125	15		15	15			1	1	78
45.3	EET58408G2-LPB	Sound and television broadcasting	5/125	15		15	15			1	1	78
46	EET52108G3-LBK	Video equipment	5/125	15			15		15	1	1	78
47	EET53408G2-K	Bachelor's Thesis	5/125						45	1	1	78
48	EET54908G2-LPB	New technologies of cellular mobile connection	5/125	15		15	15			1	1	78
49	EET52208G3-LK	Internet of Things (IoT), wireless sensor networks and smart systems	3/75	15					15	1	1	43
50	EET57908G2-LBK	Fundamentals of Designing Cellular Mobile Connection Networks	3/75	15			8		7	1	1	43

51	EET52308G3-LB	Software radio technologies in wireless communication networks	3/75	15			15			1	1	43
52	EET56308G2-LBK	Transmission radio relay and satellite systems	3/75	15			8		7	1	1	43
53.1	EET 55708G2-LP	Fundamentals of telecommunication frequency spectrum management and regulation	3/75	15		15				1	1	43
53.2	EET58108G2-LP	Telecommunication frequency spectrum management and monitoring	3/75	15		15				1	1	43
53.3	EET58908G2-LS	Intelligent-cognitive systems of telecommunication	3/75	15	15					1	1	43
54	EET53608G2-LPK	Principles of source coding of signals	5/125	15		15			15	1	1	78
55	EET57808G2- LP	signal-code systems	3/75	15		15				1	1	43
56	EET55008G2-LK	Audio signal transmission technologies	3/75	15					15	1	1	43
57	EET56508G2-LP	Universal information and communication infrastructure based on modern technologies	3/75	15		15				1	1	43
58.1	EET58808G2-LP	Information telecommunication and multiservice networks	3/75	15		15				1	1	43
58.2	EET55608G2-LP	Telecommunication networks, architecture and technologies	3/75	15		15				1	1	43
58.3	EET56408G2-LK	Modern networks of electrical communication	3/75	15					15	1	1	43
59.1	EET54108G2-LK	Modulation-coding and data transmission feedback systems	3/75	15					15	1	1	43
59.2	EET57308G2-LP	Efficient coding of telecommunication signals	3/75	15		15				1	1	43
60	EET54408G2-LK	Synchronization in fiber-optic telecommunication systems	3/75	15					15	1	1	43
61	EET53708G2-LP	Formation of digital streams	3/75	15		15				1	1	43
62	EET57408G2-LP	Optical transport systems (DWDM)	3/75	15		15				1	1	43

63	EET58208G2-LP	Design of telecommunication cable systems and networks	3/75	15		15				1	1	43
64	EET52908G2-LP	Optical transport networks	3/75	15		15				1	1	43
65.1	EET52402G3-LPB	Components of fiber-optic systems and their modeling	5/125	15		15	15			1	1	78
65.2	EET59008G2-LP	Electrical and optical components of telecommunication systems	5/125	15		30				1	1	78
66	EET52508G3-LK	Radiolocation and radionavigation	3/75	15					15	1	1	43
67	EET56908G2-LP	Radio frequency circuits	5/125	15		30				1	1	78
68	EET52608G3-LP	Signal processors	3/75	15		15				1	1	43
69	EET54708G2-LP	High frequency devices	3/75	15		15				1	1	43
70	EET54608G2-LB	Computer modeling of antennas	3/75	15			15			1	1	43
71	EET55308G2-LP	Space and ground radio communications	3/75	15		15				1	1	43

Free component

№	Subject code	Subject	Hours									
			ECTS credits/hours	Lecture	Seminar (group work)	Practical	Laboratory	Practice	Course work/Project	Mid-semester exam	Final exam	Independent work
Ch.1	HEL30212G1-LS	Foundations of philosophy	3/75	15	15					1	1	43
Ch.2	HEL20212G1-LS	History of Georgia	3/75	15	15					1	1	43
Ch.3	SOS30312G1-LS	Introduction to Psychology	3/75	15	15					1	1	43
Ch.4	SOS40312G1-LS	Introduction to Sociology	3/75	15	15					1	1	43
Ch.5	LEH16702G3-LS	Elements of Academic Writing	3/75	15	15					1	1	43
Ch.6	BUA49708G1-LS	Entrepreneurship and professional skills	5/125	15	30					1	1	78
Ch.7	SOS62902G1-LS	Business and Society	5/125	15	30					2	2	76
Ch.8	SOS58308G1-LS	Basics of economics	5/125	15	30					1	1	78
Ch.9	BUA4908G2-LP	ISO standards in information protection	5/125	15	30					1	2	77
Ch.10	PHS51008G1-LS	Creative thinking	5/125	15	30					1	2	77
Ch.11	ICT13308G1-LB	WEB Technologies (PHP)	5/125	15			30			1	2	77
Ch.12	BUA30508G1-LP	Basics of developing business projects	5/125	15		30				1	2	77
Ch.13	EET69008G1-LP	Theoretical and practical bases of standardization	5/125	15		30				1	2	77

Program Head/Heads — Shalva KVIRKVELIA

Faculty of Informatics and Control Systems
Head of Quality Assurance Service — Ketevan KOTETISHVILI

Dean of the Faculty
Of Informatics and Control Systems — Tamar LOMINADZE

Agreed
With the Quality Assurance Service of
Georgian Technical University — Davit MAKHVILADZE

Approved

At the meeting of the Council of the Faculty of Power Energy and Telecommunications on September 30, 2020

Amended

At the meeting of the Council of the Faculty of Informatics and Control Systems on December 20, 2021, Protocol No. 16

Chairperson of the Faculty Council Tamar LOMINADZE