



Master's Educational Program

Program Title

ციფრული სატელეკომუნიკაციო ტექნოლოგიები

Digital telecommunication technologies

Faculty

ინფორმატიკა და მართვის სისტემები

Informatics and Management Systems

Program Head/Heads

Professor Omar SHAMANADZE

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

Master of Engineering in Telecommunication

Will be awarded in case of completion of at least 120 credits of the educational program; the capacity of the educational component is 90 credits (5 credits are devoted to industrial internship), and the research component (Master's Thesis) includes 30 credits.

Teaching Language

Georgian

Prerequisite for Admission to the Program

A person with at least a Bachelor's degree or an academic degree equivalent to it, who is enrolled based on the results of the master's exams, according to the rules established by the Georgian legislation, has the right to study in the master's program (general master's exam and specialty exam/exams determined by GTU). Exam questions/tests will be posted on the GTU website. at least one month before the commencement of the specialty exams. Enrollment in the program without passing the master's exams is possible in accordance with the legislation of Georgia.

The applicant must have a certificate confirming knowledge of foreign English language at least B2 level or must have presented a document of completion of a corresponding training course of B2 level. In the absence of a similar certificate or other similar document, the applicant will undergo an interview in a foreign language.

Enrollment in the program without passing the master's exams is possible according to the rules established by the Ministry of Education, Science, Culture and Sports of Georgia. The right to study in the program can also be obtained by a student of another faculty of GTU or a master's program of another higher educational institution, on the basis of mobility, in accordance with the requirements of the Georgian legislation and the regulation of the educational process of GTU.

Program Description

In Georgia, as in the whole world, with the development of the Internet and digital technologies, the demand for information and communication technology, database design, security and optimization specialists, digital technology programming and application development specialists is growing, which makes the presented educational program even more relevant.

The program was amended in detail taking into account the content of the field of study, the development trends of this field, the peculiarities of the qualification to be awarded in this field and the best practices at the international level. In particular, the experience of several leading universities in the world in implementing similar programs was studied and analyzed:

1. University of Hamburg (Germany)
<https://www.masterstudies.com/Master-in-Intelligent-Adaptive-Systems/Germany/UH-MIN/>
2. University of Bologna (Italy)
https://corsi.unibo.it/2cycle/TelecommunicationsEngineering/course-structure-diagram/piano?code=9205&year=2019&manifest=en_2019_9205_000_000_2019

The program is compiled by the European Credit Transfer System (ECTS). At 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 2 years (4 semesters, 30 credits in each semester) and totals 120 credits.

The program's course content, teaching methods, and number of credits ensure that the master's program goal is achieved.

Program structure

The program consists of educational and research components.

The capacity of the educational component is 90 credits (of which 5 credits are assigned to industrial internship in telecommunications), and the research component (Master's Thesis) includes 30 credits.

The educational component includes education courses of the content corresponding to the main field of study (compulsory 50 credits, elective 40 credits). Students will complete the study components in the first three semesters, and the research component in the 4th semester. Students will undergo industrial internship in the 3rd semester at a facility selected in accordance with their chosen concentration and qualification thesis topic. The program includes 3 concentrations that students choose from the 2nd semester. The volume of each concentration, including the master's thesis, is 60 credits. (The concentration is chosen at the beginning of the second semester of study, the student chooses two 5-credit and two 10-credit subjects, respectively, in the second and third semesters). The research component of the program is the master's thesis.

The program's elective concentrations consist of groups of subjects that belong to the areas of telecommunications optical systems and broadband networks, radio engineering systems, digital telecommunications, and development planning and monitoring of telecommunications companies. Accordingly, when choosing a specific concentration, the master's research object and the topic of the final thesis will be related to one of the listed fields.

Detailed information on the requirements and assessment of the research component is provided in the regulations of the Georgian Technical University on the Master's degree.

Organization of the educational process, evaluation of student achievements, signing of educational and financial agreements with students, accumulation of credits by the student, mobility and other necessary information is provided in the "Instructions for managing the educational process at the Georgian Technical University", which is posted on the website of GTU.

Program Objective

The objective of the Master's degree program is to:

- Prepare a competitive specialist equipped with deep system knowledge and the ability to critically understand the latest technologies of digital mobile radio communication, modern technologies of digital broadcasting systems, technological development of digital telecommunications in the direction of planning and monitoring corresponding to modern market requirements, which will create the basis for innovations in the telecommunications field;
- Taking into account the evaluation of the perspectives of digital technological development of telecommunications companies and on the basis of the appropriate conclusion, to form visions for the graduate student regarding the implementation of activities with high social responsibility in the field of digital telecommunications and independently conducting further studies.

Learning Outcomes/Competences (general and sectoral)

Graduate of the "Digital Telecommunication Technologies" Master's program:

- **Evaluates** research-based deep and systemic problems in the field of digital telecommunications, which ensures the development of innovative ideas and models;
- **Analyzes** the features of functioning of telecommunication companies and institutions in a multidisciplinary environment, the principles of operation of modern digital telecommunication systems and devices, their technical data, and constructional features;
- **Substantiates** own conclusions and arguments in the field of telecommunications, in order to search for new and original ways to solve complex problems in the field of digital telecommunications;
- **Develops** original ways of solving certain specific problems characteristic of the field, taking into account the perspectives of digital technological development of telecommunication companies;
- **Formulates** justified conclusions based on critical analysis of complex and incomplete information (including the latest research), using the latest methods and approaches that reflect social and ethical responsibilities;
- **Acts** in a new, unforeseen environment and solves complex problems in the field of digital telecommunications, in both technological and planning directions, in compliance with the principles of professional integrity;
- Based on deep and systematic knowledge of the field of digital telecommunications, independently **analyzes** complex and incomplete information, its innovative synthesis, evaluation and formulation of conclusions, as well as appropriate presentation of research results to the academic and professional community;
- **Calculates** the value of the load in different modes of operation of digital telecommunication systems and networks in conditions of unknown and multidisciplinary environment;
- Independently plans further study directions and directs the process of developing/enhancing one's own learning.

In relation to the learning outcomes of the program, by overcoming groups of subjects focused on a connected topic, the learning outcomes of each concentration are concentrated in the following narrow direction:

Concentration 1 (Fiber-Optic Telecommunications Systems and Broadband Networks)

- **Possesses** deep and systematic knowledge of modern methods of broadband digital network operation reliability, its effective management and monitoring.
- **Defines** and critically evaluates the technical condition of the broadband network and the compatibility conditions of Internet protocols.
- **Analyzes** and creates the basis for innovation, development of new, original ideas for the operation of telecommunication fiber-optic systems and broadband networks, effective coding modeling, reliability of fiber-optic devices, development of optimal parameters and damage elimination.
- When solving complex problems, in unknown or multidisciplinary environment, plans and projects original ways of solving problems of static, dynamic stability and automatic protection of fiber-optic system.
- **Plans** to independently develop/enhance the further education direction at the current level of development of digital telecommunication technologies.
- **Presents** own conclusions, arguments and research results to both the academic and professional community in compliance with academic ethics standards.

Concentration 2 (Radio Engineering Systems)

- Has a deep, systematic knowledge to determine the optimal operating parameters of digital telecommunication electronic devices and ways to eliminate damage.
- Using modern techniques and methods, he searches for new, original ways of solving complex problems based on the analysis of the latest radio-technical systems and equipment's functioning.
- Manages, adapts, projects and constructs the working environment with new strategic approaches. installation and maintenance of radio technical equipment and devices using modern computer software packages, environmental technical diagnostics of radio technical equipment;
- Searches for new, original ways to solve complex problems using modern techniques and methods based on the analysis of the functioning of the latest radio technical systems and equipment.
- Manages, adapts, projects and constructs the working environment with new strategic approaches, installs and debugs radio technical equipment and devices using modern computer software packages, performs environmental and technical diagnostics of radio technical devices;
- In case of complex and/or incomplete information, analyzes and evaluates the impact of electromagnetic waves from the point of view of electromagnetic safety of people. Taking into account technical safety and environmental impact factors, determines and establishes the stages of application of modern methods of electromagnetic safety.
- At the current level of development of digital radio technical systems, independently plans the development of the further direction of study / deepening process and presents own argumentative conclusions and research results, both to the academic and to the professional society, in compliance with the standards of academic ethics.

Concentration 3 (Digital Telecommunications, Development Planning and Monitoring)

- Possesses a systematic and in-depth knowledge of the reliability, effective management, cyber security and methods of implementation and use of next generation "clean networks" of digital telecommunication systems.
- Analyzes some of the latest advances in digital telecommunication technologies and creates a basis for innovation, development of new, original ideas. From a technical point of view and taking into account economic aspects, managing and regulating the spectrum of telecommunication frequencies, monitoring the operation of digital telecommunication systems.
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- During the implementation and management of next generation technologies in telecommunications companies, taking into account market relations, international experience, critically evaluates and analyzes investment attraction and implementation processes.
- Observing the principles of academic integrity, using the latest methods and approaches, searches for original ways and conducts research independently. Determines the process of further development/enhancement of learning in the direction of development, planning and monitoring of digital telecommunication technologies.
- Responsibly presents arguments and research results to both academic and professional communities in compliance with academic ethics standards.

Methods of achieving learning outcomes (teaching-learning)

Lecture Seminar (group work) Practical Laboratory
 Practice Course work/Project Master's Thesis 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):

Verbal or oral, analysis, action-oriented learning, explanation, demonstration, discussion/debate, induction, deduction, collaborative work, cooperative learning, written work, analysis, synthesis, case study, Problem-based learning (PBL), project development and presentation.

Activities corresponding to teaching-learning methods are provided on the web page of GTU:

Detailed information on teaching-learning methods and relevant activities is provided on the web page of GTU: <https://gtu.ge/quality/Files/Pdf/scavlebis%20metodebi%20da%20aqtivobebi.pdf>

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 grade earned by the student on the supplemental examination will not be added to the number of points earned in the final assessment. The grade obtained on the additional exam is the final assessment and is reflected in the final assessment of the educational program component. In case of receiving 0-50 points in the final evaluation of the educational component, taking into account the evaluation received at the additional exam, the student is assigned an F-0 score.

Detailed information is provided on the GTU website: Instruction for managing the educational process at the Georgian Technical University.

Fields of Employment

Graduates will be able to get a job in the following facilities: 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; Telecommunication equipment, components, systems processing-creation and production establishments.

Opportunities for continuing education

PhD 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: 43

