



საქართველოს ტექნიკური უნივერსიტეტი
GEORGIAN TECHNICAL UNIVERSITY

Approved by
GTU Academic Board
Resolution №733
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GTU Academic Council
Resolution 01-05-04/95
April 2, 2018

Master's Educational Program

Name of the program

Telecommunication

Faculty

Power Engineering and Telecommunication

Head of the Program

Professor Jemal Beridze

Qualification to be awarded

Master of *Engineering in Telecommunication*
Shall be awarded in case of performing no less than 120 credits of the educational program

Language of Instruction

Georgian

Prerequisite for admission to the program

A student with a Bachelor's or equivalent academic degree has the right to study at the master's program, who will enroll in the program on the basis of the results of the Master's Exams (Centralized Entrance Master's Exams and exam defined by GTU). Candidates wishing to study on the Master's program - Telecommunication should pass an entrance exam on the topics covered in the chosen direction.

Examination tasks/tests will be posted on GTU Teaching Department website <http://www.gtu.ge/study> at least one month before the exams. Enrollment in the program without passing the Master's Exams is possible in accordance with the rule established by the Ministry of Education and Science of Georgia.

Description of the program

The program capacity is 120 credits which are distributed as follows: Special subjects - 95 credits (79.1%); General engineering subjects - 10 credits (8,33%); Managerial subjects - 25 credits (8,33%); Humanitarian subjects - 5 credits (4,17%). The first year of study includes managerial subjects (10 credits), general engineering subjects (10 credits), humanitarian subjects (5 credits), specialty subjects (25 credits), composition of Master research prospectus (5 credits) and subjects connected with the Master's thesis topic (5 credits). The first semester of the second year of the study should cover the subjects, related to the Master's thesis (20 credits) and preparation and defense of the colloquium (10 credits); The second semester is fully covered by preparing the Master's thesis and its defense (30 credits).

At the beginning of the 2nd semester of the first year of the study, the student chooses one of the 9 topics covered by the Master's Program and suggested by the supervisor, and related subjects. Each topic provides one 5-credit and two 10-credit subjects.

Submission of subjects, evaluation of the prospectus, colloquium and master's thesis is made by the methods and criteria obtained at the Georgian Technical University. Specifically, in case of relevant subjects of the teaching

components, the student's knowledge during the semester is evaluated by using 3 forms (current activity, midterm exam and final/additional exam). Each form and component of the evaluation from the general score of the assessment (100 points) is defined in the final assessment. Also, in each form of assessment the minimum competence limit is defined. Maximum score of current activity is 30 (minimum positive assessment is 15 points), maximum score of midterm exam is 30 (minimum positive assessment is 15 points), maximum score for final/additional exam is 40 (minimum positive score is 20 points). As for the program research components (dissertation research prospectus and colloquiums), their assessment is made once within 100 points. In order to pass any component of the educational of the program, the student should accrue at least 51 points during the semester. In case the student has accrued 41 to 50 points in the program component during the semester, the program's relevant component is not passed and he is entitled to the right to pass an additional exam with independent work. In case of taking additional exam, the score received at the main exam is canceled. If the assessment does not exceed 40 points during the semester, the student has to retake the subject.

The purpose of the program

The aim of the Master's Program is to prepare specialists for the professional requirements of the telecommunications industry, including broadband digital networks, Fiber-optical technologies, digital mobile radio communication and digital broadcasting systems, the principles of transmission of electromagnetic fields and waves, problems of satellite technology and electromagnetic ecology. The educational program envisages the possibility of studying international standards, professional development perspectives and performance characteristics, management and marketing of relevant professional activities. The educational program envisages the possibility of studying professional activities relevant to the international standards, perspectives and functioning peculiarities of technical development of enterprises and facilities, management and marketing.

Learning Outcomes and Competences (General and Sectorial)

Knowledge and understanding:

Has deep and systemic knowledge based on the research of telecommunication problems and relevant skills enabling development of new, original ideas.

Knows: International standards, regulations, normative acts and other teaching materials relevant to the professional activities; Perspectives of technical development of enterprises and facilities and of their functioning peculiarities; Principles, technical data and constructive peculiarities of modern telecommunication systems and equipment; Research methods and determination of the conditions for conducting research work; Basic requirements for technical documentation development and practical patterns or devices; Mathematical apparatus related to scientific research work and determination of technical and economic efficiency of the obtained results; Achievements of science and technology in the field of telecommunication; The basics of the economy, production organization, labor and management; Labor legislation; Labor protection rules and norms.

Is aware of the separate specific problems peculiar to the field and ways of their solution.

Applying knowledge into practice:

Is able to: act in a new, unforeseen and multidisciplinary environment; Search for new, original ways to solve complex problems in the field of telecommunication, including independent research using the latest methods and approaches; Formulate and resolve tasks independently in the process of scientific research, requiring deep professional knowledge; Selection of the necessary methods of research based on the specific research tasks; Modify existing methods and process new methods of research; Process research and observation results, apprehend and analyse the results by taking into consideration the data given in the literature; Conduct bibliographic works using modern information technologies; Present the results of the conducted work through reports, summaries and an article by using modern means of editing, printing and displaying; Organize the work of performers and executive management decisions under different opinions; Develop proposals and activities of methodical, statutory and technical documents for the implementation of processed projects and programs; Use advanced experiences to ensure efficient production and introduction of the latest methods of science and technology.

Has the ability to determine the main issues (component), set the relevant time frames and draw up the graphs to accomplish the set goals.

Making judgments:

Has: the ability to develop innovative synthesis of information based on critical analysis of critical and incomplete information (including the latest research), and the latest data.

Is able to: analyse the results obtained on the basis of the fundamental and applied research of telecommunication field; make conclusions on the results of observations and measurements with participation in experiments; Develop the methodology and program of the relevant system test in the modernization and operation of telecommunication equipment, forecasting and analysis of the results.

Make technical justification of the decisions made for the development of telecommunication systems and networks; Implement simulated and mathematical models of functioning of telecommunication systems and networks; Analyse perspectives of the condition and development of telecommunication techniques.

Communication skill:

Is able to: communicate in Georgian and foreign languages with the academic and professional community of telecommunication industry, considering the achievements of the processes in the telecommunications systems and equipment and its conclusions, the arguments and research methods of academic honesty and information-communication technologies; Prepare a detailed written report on his/her ideas on solving the problems in the field of telecommunication; make public speeches.

Ability to learn:

Is able to: determine his/her learning directions to enhance professional knowledge and experience; understand the peculiarities of the learning process, plan its strategy at a higher level, evaluate the sequence of learning and conduct the process independently; conduct creative and innovative activities. He/she has analytical and logical thinking and ability to receive, process and analyze new information. Is prepared to pursue studies in Doctoral program in telecommunication and other related programs.

Values:

Is able to: evaluate his/her and other person's attitude towards values and contribute to the establishment of new values; Protect accepted norms of professional values, ethics and morals.

Knows the ethical and legislative norms on the basis of which he/she has to act in the society and in the company. Is responsible for environmental protection and solving environmental problems. Has obligation of human rights protection and the ability to understand the necessity of social responsibility and civil self-consciousness.

Forms and methods of learning outcomes

Lecture Seminar (team working) Practice work Laboratory Practice

Course paper / project Master's thesis Consultation Independent work

Based on the specificity of the particular course, the appropriate activities of teaching-learning methods are used that are depicted in the course programs (syllabus):

1. **Discussion / debate** - one of the most common methods of interactive teaching. Discussion process increases the quality and activity of student engagement. Discussions can be overcome in the debate and this process is not limited to the questions asked by the teacher. It develops a student's ability to reason and to justify his opinion.
2. **Cooperative Teaching** – Is a teaching strategy in which each group member is obliged not only to study for himself, but also to help his team members to understand the subject better. Each member of the group works on the problem, until all of them master the subject.
3. **Collaborative Work** - This method involves dividing students into groups and giving them instruction. The group members work on the issue individually and in parallel share their opinions with other members of the group. Depending on the set objective, it is possible to divide the functions among the members of the Group during work process. This strategy ensures maximum involvement of all students in the learning process.
4. **Case study** – The teacher discusses particular cases with students and they will learn the issue thoroughly. For example, in the field of engineering security it can be a particular accident or catastrophe in political science, for example, the analysis of the Karabakh problem (Armenian-Azerbaijani conflict), etc.
5. **Brain storming** - This activity promotes formation and expression of the radically different opinion, idea

within the premises of the topic. The mentioned activity contributes to the development of a creative approach to the problem. Use of the method is effective in the existence of 2 large number groups of students and consists of several main stages:

- Determining problem / issue in creative perspective; Making note without criticizing the ideas expressed by the listeners in a certain period of time (mainly on the board);
 - Determining assessment criteria to state the relevance of the idea with the aim of the research;
 - Assessing selected ideas according to the predetermined criteria;
 - Selecting the ideas that are most relevant to the issue, by the method of exclusion;
 - Identifying the idea having the highest assessment, as the best means revealing the solution of the problem.
6. **Role-playing and situational games** - include the types of games that involve business (role-playing) games, didactic or educational games, playing situations (situational games), playing techniques and procedures. The games under the predefined scenario allow students to look at the issue from different positions. It helps them to develop an alternative viewpoint. As discussions, these games also formulate the student's ability to express his/her position independently and to defend his/her argument in debates.
 7. **Demonstration Method** - This method involves visual representation of information. In terms of achieving the result it is quite effective. In many cases, it is best to provide the materials simultaneously with audio and visual means. The study material can be demonstrated by both - the teacher and the student. This method helps to visualize the different levels of learning material, to specify what students will have to do independently; at the same time, this strategy will visually represent the essence of the issue/problem. Demonstration may be simple.
 8. **Analysis Method** - Helps dissolve the learning material as part of one whole component. This will simplify detailed coverage of individual issues within a difficult problem.
 9. **Verbal or oral method** - Narration, speaking, etc. belong to this activity. In this process, the teacher represents the teaching material verbally, explains the teaching material, and the students perceive and acquire the material by listening, remembering and apprehending.
 10. **Written work method**, which implies the following types of activities: making extracts and records, summarizing material, composing the theses, composing/writing abstract or essay etc.
 11. **Explanatory method** - is based on the discussion around the given issue, a teacher gives particular example being discussed in details within framework of the topic.
 12. **Action-oriented teaching** - requires the involvement of the teacher and the student in the teaching process, where the practical interpretation of the theoretical material is taken into consideration.
 13. **Elaboration and presentation of the project** - While working on the project, the student uses acquired knowledge and skills to solve the real problem. The project enhances student motivation and responsibility. The work on the project involves planning, research, practical activity and the stages of presenting the results in accordance with the selected issue. The project is considered to be implemented if its results are presented in a clear and convincing way. It can be performed individually, in couples or in groups. At the same time the project can be made within the frames of one subject or several subjects (integration of the subjects); After completion, the project will be presented to a wide audience.

Student knowledge assessment system

Assessment 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 the subject and is given the right to take the additional exam once 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.

Field of employment

The objective of professional development of telecommunication engineering is the technical means of digital and analog messaging networks and systems for telecommunication companies, devices and transmission, processing, storage and information distribution systems; Telecommunication networks and switching systems; Multichannel telecommunication systems Optical range telecommunication systems; Radio communication, satellite communication and mobile radio communication systems and equipment; Radio and television broadcasting, Electric acoustics and informatics, multimedia equipment systems and equipment; Data transmission systems and devices; Means of information protection in telecommunication systems; Means of metrological provision for telecommunication systems and networks.

Opportunity to continue learning

Doctoral Educational Programs

Human and material resources necessary for the implementation of the program

The program is provided with appropriate human and material resources.

1. The research works will be conducted in the laboratories and computer classes of the Telecommunication Department:

- Laboratory of IP Technologies (N513-A);
- Compact coding laboratory for telecommunication theory and telecommunication signals (N608);
- Transmission Systems Laboratory (N604);
- Radio System Recycling Laboratory (N612);
- Computer classes (NN504, 510, 610);
- Laboratory of Human Electromagnetic Safety and Electromagnetic Ecology (No. 913)

On the basis of the memorandums and agreements in the companies' facilities: JSC "Silknet"; Ltd. "Georgian TV and Radio Center"; Ltd. "Electromagnetic Compatibility and Interference Monitoring Service".

2. The program is served by highly qualified academic staff:

- Professor David Beriashvili;
- Professor Nodar Ughrelidze;
- Professor Faik Bogdanov;
- Professor Jemal Beridze;
- Professor Tamaz Kupatadze;
- Professor Janiko Khuntsaria;
- Professor Otar Zumburidze;
- Professor Aleksandre Robitashvili;
- Professor Revaz Svanidze;
- Professor Lali Khuntsaria;
- Professor Omar Shamanadze;
- Professor Sergo Shavgulidze;
- Professor Nanuli Gibradze;
- Professor Kakha Khoshtaria;
- Professor Teimuraz Kortua;
- Associate Prof. Vakhtang Abuladze;
- Associate Prof. Maia Koplastadze;
- Associate Prof. Yuri Modebadze;
- Associate Prof. N. Abzianidze;
- Associate Prof. Teimuraz Mtvralashvili;
- Associate Prof. Marina Kurdadze

For additional information on human and material resources see attached documents.

Number of attached syllabuses: 43

Program subject:

№	Learning component	Precondition to admission	ECTS credits			
			I Year		II Year	
			Semester			
			I	II	III	IV
1.1	Business Communication (English),	N/A	5			
1.2	Business Communications (French),					
1.3	Business Communication (German),					
1.4	Business communication (Russian).					
2.1	Theory and practice of field text translation (English),	N/A	5			
2.2	Theory and Practice of French Text Translation (French),					
2.3	Theory and Practice of Field Text Translation (German),					
2.4	Theory and Practice of Field Text Translation (Russian)					
3	Entrepreneurial and Technological Innovation Management	N/A	5			
4	Mathematical methods of Traffic Engineering theory 1	N/A	5			
5	Mathematical methods of Traffic Engineering theory 2	Mathematical methods of the Traffic Engineering theory 1	5			
6	Computer Technologies 1	N/A	5			
7	Computer Technologies 2	Computer Technologies 1	5			
8	Radio signals	N/A	5			
9	Special chapters of telecommunication theory 1	N/A	5			
10	Special chapters of telecommunication theory 2	Special chapters of telecommunication theory 1	5			
11.1	Master Topics: Optical systems of telecommunication;	Special chapters of telecommunication theory 1				
11.2	Digital telecommunication signals compression	Special chapters of telecommunication theory 1	5		20	
11.3	Management and regulation of telecommunication spectrum	Special chapters of telecommunication theory 1				
11.4	Communications networks, nodes and distribution of information;					

11.5	Radio-technical systems	Radio signals				
11.6	Antenna techniques	Radio signals				
11.7	Electromagnetic Ecology;	Radio signals				
11.8	Digital Telecommunication;	Computer Technologies 1				
11.9	Telecommunication Management	Entrepreneurial and Technological Innovation Management				
In semester			30	25	20	
Total:			75			
Research Component:						
	Master Research Project / Prospectus	N/A		5		
	Theoretical / experimental research / colloquium	Master Research Project / Prospectus			10	
	Completion and protection of master thesis	First 90 credits of the program				30
Total in semester:			30	30	30	30
Total in year:			60		60	
Total:			120			

Master topics subject load

11.1	"Optical Systems of Telecommunication"					
11.1.1	Modern fiber-optic technologies	Special chapters of telecommunication theory 1		5		
11.1.2	Linear coding in fiber-optical systems	Modern fiber-optic Technologies			10	
11.1.3	Optical transport technologies	Modern fiber-optical Technologies			10	
11.2	"Digital Telecommunication Signals Compression"					
12.2.1	Digital Television	Special chapters of telecommunication theory 1		5		
11.2.2	Principles of signal effective coding	Digital Television			10	
11.2.3	Methods of telecommunication signals compression	Digital Television			10	
11.3	"Management and regulation of telecommunication spectrum"					
11.3.1	Orbit-Spectrum Regulation of Telecommunication Satellite Systems	Radio Signals		5		
11.3.2	Economic Aspects of Telecommunication Frequency Spectrum Management and Regulation	Radio signals			10	

11.3.3	Economic aspects of telecommunication frequency spectrum monitoring and inspection	Orbit Spectrum regulation of telecommunication satellite systems.			10	
11.4	"Communications networks, nodes and distribution of information"					
11.4.1	Broadband digital networks - xDSL technologies	Mathematical methods of Traffic Engineering theory 1		5		
11.4.2	Digital Mobile Radio Connection	Broadband digital networks - xDSL technologies.			10	
11.4.3	Broadband digital networks - modern networking technologies	Broadband digital networks - xDSL technologies.			10	
11.5	Radio Technical Systems					
11.5.1	Signals modulations	Radio signals		5		
11.5.2	Audio-video technology and Automation of design	Signals modulates			10	
11.5.3	Coded signals	Signals modulates			10	
11.6	"Antenna devices"					
11.6.1	Technical Electrodynamics	Radio signals		5		
11.6.2	Electromagnetic waves in natural conditions	Technical Electrodynamics			10	
11.6.3	Antennas	Technical Electrodynamics			10	
11.7	"Electromagnetic Ecology"					
11.7.1	Space Ecology	Radio signals		5		
11.7.2	Electromagnetic fields and Nature	Space Ecology			10	
11.7.3	Human Electromagnetic Safety	Space Ecology			10	
11.8	"Digital Telecommunication"					
11.8.1	Data networks	Computer Technologies 1		5		
11.8.2	Mathematical models of digital information transmission systems	Data networks			10	
11.8.3	Cryptography	Data networks			10	
11.9	"Telecommunication Management"					
11.9.1	Investment activities in telecommunication	Entrepreneurial and Technological Innovation Management		5		
11.9.2	Management of telecommunication companies	Investment activities in telecommunication			10	
11.9.3	Market relations and finances in telecommunication companies	Investment activities in telecommunication			10	

Head of the program Jemal Beridze

Head of Quality Assurance Service of
Faculty of Power Engineering and Telecommunication Nikoloz Abzianidze

Dean of the faculty Gia Arabidze

Approved by

Faculty of Power Engineering and telecommunication
At the Faculty Board Meeting
03.07.2012.

Head of the Faculty Board Gia Arabidze

Agreed with

Quality Assurance Service of GTU

Irma Inashvili

Modified by

Faculty of Power Engineering and telecommunication
At the Faculty Board Meeting
27.03.2018, Protocol №2
Chairman of the Faculty Council

Gia Arabidze

Head of the Faculty Board Gia Arabidze