საქართველოს ტექნიკური უნივერსიტეტი
GEORGIAN TECHNICAL UNIVERSITY

**Approved by**
Resolution № 733 of the Academic Council of GTU dated July 6, 2012

**Amended by**
Resolution № 01-05-04/183 of the Academic Council of GTU dated October 12, 2020

# PhD Educational Program

## Program Title

| |
|---|
| ციფრული სატელეკომუნიკაციო ტექნოლოგიები |
| Digital telecommunication technologies |

## Faculty

| |
|---|
| ენერგეტიკა და ტელეკომუნიკაცია |
| Power Energy and Telecommunications |

## Program Head/Heads

Professor Otar ZUMBURIDZE

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

**Doctor of Engineering in Telecommunication**
will be awarded upon completion of 55 credits of the study and research components of the educational program. Duration of education is 3 years.

## Teaching Language

Georgian

## Prerequisite for Admission to the Program

Enrollment in the program is carried out according to the rules established by the legislation of Georgia. The applicant must meet the following requirements:

- Master's degree or equivalent academic degree;
- The knowledge of the English language at B2 level. The applicant must pass the entrance exam at the GTU exam center or present a relevant international certificate proving knowledge of a foreign language. An applicant with a higher education in English is not required to present a certificate or pass an exam. Enrollment in the educational program is also possible on a mobility basis twice a year, within the time limits established by the Ministry of Education, Science, Culture and Sports of Georgia, following the mandatory procedures and the rules established by the university.

Persons wishing to enroll in the program must submit: a research project, where the purpose and direction of the applicant's research are outlined.

The applicant goes through an interview with the faculty temporary committee, which is approved annually by the Academic Council of GTU.

During the interview, scientific publications and/or inventions, participation in scientific conferences, trainings and other experience of educational/research activities, confirmed by relevant prints, patents, certificates, deeds, etc. will be taken into account.

The procedure for admission to PhD studies and enrollment conditions are given on the university's website.

Enrollment in the educational program is also possible on a mobility basis within the time limits established by the Ministry of Education, Science, Culture and Sports of Georgia, following the mandatory procedures and the rules established by the university.

Enrollment in the program or transfer from a recognized Higher Educational Institution of a foreign country is carried out in accordance with the rules defined by the legislation of Georgia.

## Program Description

Modern telecommunications technology is an important basis for socio-economic development in today's global and increasingly digital economy. It is a powerful tool for accessing information and engaging citizens in public life. The strategy of socio-economic development of Georgia (Georgia 2020) emphasizes the importance of promoting the widest possible use of information and communication technologies both for the growth of business competitiveness and for the population. In this direction, in order to offer new opportunities for education, research and technology, since 2012, the PhD program in telecommunications has been implemented in GTU, and the post-modification program is called "Digital Telecommunication Technologies". The program is compiled using the European credit transfer system ECTS. At GTU 1 credit is equal to 25 hours, including contact and independent work hours. The distribution of credits is presented in the program curriculum. The program lasts at least 3 years, the educational component includes 55 credits. During the modification of the program, the experience of several leading universities of the telecommunication profile in the implementation of similar programs was studied and analyzed, namely:

1. Norwegian University of Science and Technology, PhD Program in Electronics and Telecommunications.
   https://www.ntnu.edu./studies/phet/programme-components
2. Atlantic International University, USA, PhD program in telecommunications.
   https://www.aiu.edu./Doctor-of-Telecommunications.html
3. Brno University of Technology, Czech Republic, PhD Program in Electronics and Telecommunications.
   https://www.phdstudies.com/PhD-in-Electronics-and Communication-Technologies/Czech-Republic/Brno-University-of-Technology/
4. University of Texas at Dallas, USA, PhD Program in Electrical Engineering and Computer Science.
   https:/catalog utdallas.edu/now/graduate/programs/ecs/telecom-engineering,

The educational component of the doctoral program consists of a compulsory and an optional component, which the PhD student must take in the first and second semesters. For the compulsory courses of the educational component of the PhD program- 45 credits are defined, for elective educational courses-10 credits.

The PhD candidate establishes an individual curriculum in agreement with the scientific supervisor and is obliged to submit the research results to the academic department/commission at the end of the second, third, fourth, and fifth semesters according to the PhD regulations of the Georgian Technical University.

The research component of the program is the preparation and defense of a Thesis. It reflects the scientifically substantiated new results of the research conducted by the PhD student and/or solves an actual scientific problem.

## Program Objective

To equip PhD students with the relevant knowledge and skills based on the latest achievements in the field of modern digital telecommunication technologies, with the objective that graduates occupy leading positions in the field of scientific research, as well as in academic and service fields; By focusing on the implementation of innovative research projects, following the generally recognized norms and principles of professional ethics, make a significant contribution to the development of the field.

## Learning Outcomes/Competences (general and professional)

- **Acquires** knowledge based on the latest advances in digital telecommunications, which enables the expansion of existing knowledge through a systematic and critical understanding of the field of study and/or activity in an interdisciplinary context;
- **Develops** the latest research and analytical methods and approaches in the direction of digital telecommunications, which are focused on the creation of new knowledge and are reflected in internationally referable publications;
- **Determines** research methods and conditions for conducting research work based on relevant international standards of professional and scientific activity, methodical, normative and other guidance materials;
- **Predicts** the effectiveness of research results based on the use of mathematical apparatus related to scientific-research works;
- **Creates** simulation and mathematical models of the functioning of telecommunication systems and networks and analyzes the prospects for the development of digital telecommunication technologies;
- In order to solve a complex problem, **analyzes** and **evaluates** complex/contradictory information and by making effective decisions independently, presents the results in a justified manner to specialists and the general public, with appropriate participation in thematic discussions held at the international level, as well as in academic activities focused on knowledge transfer.
- Focusing on the creation of new knowledge, **plans** and **conducts** research in the direction of digital telecommunications and organizes scientific and technical knowledge raising events;
- As a result of the critical analysis, synthesis and evaluation of modern approaches, **predicts** the development trends of telecommunication technologies and reflects them in the development plans of the academic and scientific direction.
- Adhering to the principles of academic and managerial integrity, independently **implements** innovative research projects based on the latest engineering and technological achievements in the field of telecommunications.

## Methods of achieving learning outcomes (teaching-learning)

☒ Lecture ☒ Seminar (group work) ☒ Practical ☐ Laboratory ☐ Scientific and Thematic seminar ☒ Independent work ☒ Consultation ☒ Research component ☒ Structure of the thesis ☒ Thesis defense

In the learning process, depending on the specifics of a particular study course program, the following activities of the teaching-learning methods are used, which are outlined in the relevant study course programs (syllabi): discussion/debate, brain storming, induction, deduction, analysis, synthesis, writing work, explanation, action-oriented learning, project development and presentation, problem-oriented learning, case study, demonstration.

## Student's Knowledge Assessment System

Educational program is assessed on a 100-point scale.

Assessment of the educational component:
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 % of the assessment, 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 obtained in the additional exam is not added to the grade obtained in the final assessment. The grade obtained on the additional exam is the final grade 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.

### Assessment of the scientific-research component/components:

a) Excellent (summa cum laude) - excellent performance:

b) Very good (magna cum laude) - result exceeding the requirements in all parameters;

c) Good (cum laude) - a result that exceeds the requirements;

d) Satisfactory (bene) - an average level work that meets the basic requirements;

e) Sufficient (rite) - a result that, despite its shortcomings, still meets the requirements:

f) Insufficient (insufficienter) - an unsatisfactory level work that cannot meet the requirements due to significant deficiencies in the work:

g) Completely unsatisfactory (sub omni canone) - a result that completely fails to meet the requirements:

The assessment of the research component of the PhD educational program is done once, with a final assessment.

## Fields of Employment

The graduate can be employed in organizations operating in the public and private sector: in scientific-research institutions, in higher educational institutions in professional activity facilities: focused on digital networks and systems, e.g. in public and corporate telephone networks; Also employment facilities are represented by: cellular, mobile, Internet and optical fiber networks; Radio communication, radio broadcasting and television companies; Terrestrial and satellite communication facilities; cable TV; Graduates of the program will be able to work as qualified experts in the field of telecommunications, both within the country and internationally.

## Human and material resources needed to implement the program

The program is provided with unique experience and highly qualified human capital. The authors of the syllabuses of the training courses and the supervisors of the doctoral students are the professors of the Georgian Technical University.

The program is provided with appropriate material resources: learning materials, library resources, laboratories, computer classes, computer programs, limitless Internet. If necessary, research works can be carried out at the facilities of the following companies: JSC "Silknet"; LLC "Teleradiocenter of Georgia"; on the basis of pre-signed memoranda and "agreements.

Additional information about the program's human and material resources is provided in the attached documents.

**Number of attached syllabi: 15**