საქართველოს ტექნიკური უნივერსიტეტი
GEORGIAN TECHNICAL UNIVERSITY

Approved
Academic Council of
Technical University of
Georgia
June 6, 2011
By Resolution No. 733
is Modified
Academic Council of
Technical University of
Georgia
22.12.2022
By Resolution № 01-05-02

Master's degree educational program

Name of the program

ქიმია
Chemistry

the faculty

ქიმიური ტექნოლოგიისა და მეტალურგიის
Chemical Technology and Metallurgy

Program Head/Heads

Professor Zurab Geliashvili, Professor Irine Berdzenishvili

Qualifications to be awarded and the extent of the program in terms of credits

Master of Chemistry Awarded upon completion of at least 120 credits of an educational program

the language of instruction

Georgian

Prerequisite for admission to the program

The right to study at the magistracy has a person who has a degree not lower than a bachelor's degree or an equivalent academic degree, enrolled on the basis of the results of master's examinations (general master's examination and examination/examinations determined by the GTU). Exam questions/tests will be posted on the website of the Educational Process Management Department of GTU http://www.gtu.ge/study/index.php at least one month before the exams. The applicant must have a certificate confirming knowledge of English at least B2 level or must have a certificate of completion of the corresponding B2 level course of study. In the absence of a similar certificate or other similar document, the applicant is tested in English at the GTU testing center. Admission to the program without passing the master's exams is possible according to the rules

established by the Ministry of Education and Science of Georgia.

External mobility. Enrollment in an educational program is also possible by mobility, in accordance with the "Rules for the transfer from a higher educational institution to another higher educational institution", approved by the order of the Minister of Education and Science of Georgia dated February 2, 2010 10 / n;

Internal mobility. Applicants will also be admitted to the educational program on the basis of internal mobility. The conditions and procedure for internal mobility are determined by the order of the rector of the university and the information is posted on the website of the university.

Program description

The program is based on the ECTS system, 1 credit is equal to 25 hours including both contact and independent working hours. The distribution of credits according to subjects is presented in the curriculum. The duration of the master's program is 2 academic years i.e. 4 semesters and includes 120 credits; (4 semesters, each semester includes 30 credits); according to the student's individual workload the number of credits per year can be less or more than 60 credits but not more than 75 credits.

The program includes educational and research components: educational component (educational courses), compulsory and elective - 90 credits; research component - 30 credits.

The research component is determined in the IV semester which provides for completion and defense of a master's thesis - 30 credits.

https://gtu.ge/Study-Dep/Forms/Regulations.php

The study schedule, mid-semester dates and final/supplementary exam dates are determined at the beginning of each semester by the rector's order on the basis of the "Instructions for managing the educational process at the Georgian Technical University".

Program structure:

The program includes:

1. Compulsory courses on content corresponding to the main field of study: 55 (ECTS) credits;
2. Concentrations: (implying the grouping of training courses of the relevant content of the main field of study by focusing on a specific topic/problem) - the volume of each concentration is 65 (ECTS) credits, taking into account the component of completing and defending a master's thesis;

The program includes 3 elective concentrations. The student has the opportunity to choose one of the available concentrations according to his desire:

1. Organic Chemistry
2. Physical chemistry
3. Inorganic chemistry

The study schedule, mid-semester dates and final/supplementary exam dates are determined at the beginning of each semester by the rector's order on the basis of the "Instructions for managing the educational process at the Georgian Technical University".

Detailed information about the magistracy is available on the GTU website:

"Regulations on the Master's Program of the Georgian Technical University", "Rules for Evaluating the Research Component of the Master's Educational Program" and "Individual Work Plan of the Master Student".

https://gtu.ge/Learning/debuleba_magistraturis_sesaxeb.php

Information about the organization of the educational process, the assessment of student achievements, the conclusion of educational and financial contracts with students, the accumulation

of loans by students, mobility and other necessary information is given in the “Instructions for managing the educational process at the Georgian Technical University”, which is posted on the GTU website on the page: https://gtu.ge/Study-Dep/Forms/Forms.php

Purpose of the program

The aim of the master's program is to prepare a highly qualified specialist in the field of chemistry with systematic and in-depth knowledge of chemistry.

1. To give the master's students deep and systematic knowledge in the direction of organic, physical and inorganic chemistry to develop professional skills for a successful career in the modern labor market;

2. Formation of graduates' competencies, which is necessary for the adequate, effective and successful implementation of professional activities in solving many problems of a chemical nature in various fields of production;

3. The graduate should be able to independently synthesize compounds with new properties, research their properties and search for innovative methods and approaches for application by critical analysis of the latest data of chemical research problems.

Learning outcomes/competencies (general and professional)

1. Has deep and systematic knowledge in such areas of chemistry as organic chemistry, physical chemistry and inorganic chemistry, owns modern methods of physical and chemical research and has skills in their practical application;
2. By compatibility of program concentrations, finding new original ways to solve complex problems in this area describes the structure and physical-chemical properties of substances of various nature using the latest scientific methods and approaches;
3. Determines the physical-chemical properties of organic and inorganic compounds and uses a critical analysis of new information obtained in scientific research to solve problems facing organic, inorganic and physical chemistry;
4. Determines the challenges facing the chemical sciences due to modernity, the development of methods for the synthesis of new substances with desired properties, innovative methods of structural research and analysis, new possibilities for using substances;
5. Uses modern innovative methods identified on the basis of the latest literature data in the synthesis and analysis of new chemical compounds, in determining the structure, purity and properties of an unknown substance;
6. Formulates the results obtained on the basis of the analysis of the literature and / or experiment, and conclusions about the purity and structure of the analyte (including new ones);
7. Presents his reasoned conclusions and research methods when communicating with an academic or professional society in Georgian and English, a presentation on the completed task to specialists in this field and to the general public;
8. Realizes the peculiarities of the learning process and the high level of strategic planning as well as the ability to transfer and constantly update knowledge on the basis of acquired theoretical and practical experience;
9. Evaluates his own and others' attitude towards the introduction of new valuables and takes care of establishing modern standards of professional ethics.

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

narrow direction:

Concentration 1 - Organic chemistry

- Has deep and systematic knowledge of the structure of various types of organic compounds, their reactivity, the possibilities of developing modern methods for the synthesis of new substances.

- Using the methods of structural research and determination of the identity of organic substances in an unknown or interdisciplinary environment, while critically analyzing information obtained from various sources, based on knowledge of their properties and methods of synthesis, independently assesses the importance of their use on a laboratory and / or industrial scale in solving chemical problems.

Concentration 2 - physical chemistry

- Has deep and systematic knowledge of the essentiality of the basic laws of physical chemistry, the structure of substances, the energy characteristics of chemical processes, their profitability, the consumption of reagents, the degree of formation of products, the development of processes over time, the kinetic regularities of catalytic processes, as well as the relationships in the chain "composition-structure-properties".

- Independently evaluates and solves important research and applied problems in interdisciplinary areas on the basis of modern research methods and computer modeling technologies in the relevant professional field.

Concentration 3 - inorganic chemistry

-Has a deep and systematic knowledge of the field of inorganic and analytical chemistry, the ability to use modern accurate analytical and specialized laboratory equipment to study chemical systems and objects.

- Possesses modern physical and chemical research methodology, innovative methods of structural research and analysis, new possibilities of substances and skills of their practical use.

Methods of achieving learning outcomes (teaching-learning).

☒ lecture ☐ Workshop (group work) ☒ practical ☒ laboratory ☒ practice ☒ Course work/project ☒ Master thesis ☒ Consultation ☒ Independent work

In the learning process, depending on the specifics of the specific training course program, the following activities of the teaching-learning methods are used, which are reflected in the relevant training course programs (syllabi):

Activities corresponding to teaching-learning methods: discussion/debate; cooperative learning; group (collaborative) work; problem-based learning (PBL); case study (Case study); Brain storming; role-playing and situational games; demonstration method; induction method; deductive method; analysis; synthesis; verbal or oral; written work; explanatory; action-oriented learning; Project development and presentation.

Detailed information about teaching-learning methods and relevant activities is provided on the STU website:

https://gtu.ge/quality/Files/Pdf/scavlebis%20metodebi%20da%20aqtivobebi.pdf

Student knowledge assessment system

Evaluation is done on a scale of 100 points.

Positive evaluations are:

- (A) - Friadid - 91-100 evaluation points;
- (B) - very good - 81-90 evaluation points;
- (C) - good - 71-80 evaluation points;
- (D) - satisfactory - 61-70 assessment points;
- (E) - sufficient - 51-60 assessment points.

Negative evaluations are:

- **(FX) -** failed - 41-50 assessment points, which means that the student needs more work to pass and is allowed to take the additional exam once with independent work;
- **(F) -** failed - 40 evaluation points and less, which means that the work done by the student is not enough and he has to study the subject anew.

In case of acceptance of FX, an additional exam is prescribed, at least 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.

The rules for evaluating the research component of the master's educational program are given at the following email address:

https://gtu.ge/Study-Dep/Files/Pdf/mag_dan5_181119_SD.pdf

The rule of evaluation of the educational component of the master's educational program is provided at the following email address:

https://gtu.ge/Study-Dep/Files/Pdf/sasw_proc_mart_inst_18.1119_SD.pdf

field of employment

- Chemical expertise/research laboratories;
- Various kinds of chemical or related enterprises (wine, beer, cognac, alcohol, champagne, essential oils, factories for the production of vegetable and animal fats);
- Pharmaceutical, beverage, food products, agriculture, customs service, environmental protection and sanitary, clinical, forensic and etc. chemical lab services;
- State agencies and international organizations.

The possibility of continuing education

Doctoral educational programs

Human and material resources necessary for the implementation of the program

The Master's educational program is provided with appropriate human and material resources. See the accompanying documentation for more information.

Number of attached syllabi: 37

Subject load of the program

№		Admission prerequisite	ECTS credit	
			I year	II year

	learning course		semester			
			I	II	III	IV
1	Foreign Language for Business Communication (English)	does not have	5			
2	Management of Entrepreneurial and Technological Innovations	does not have	5			
3	Theoretical Inorganic Chemistry	does not have	4			
4	Chemistry of Hydrocarbons	does not have	4			
5	Physical and Colloid Chemistry for magistrates	does not have	4			
6	Theoretical Analitical Chemistry	does not have	4			
7	Pedagogy	does not have	4			
8	Theory and Practice of specialized Translation (English	does not have		5		
9	Physics and Chemistry of Macromolecules	Physical and Colloid Chemistry for magistrates, Chemistry of Hydrocarbons		5		
10	Physical–Chemical Analytical Methods of Compounds	Physical and Colloid Chemistry for magistrates, Theoretical Analitical Chemistry		5		
11	Mechanisms in Organic Chemistry	Chemistry of Hydrocarbons			5	
12	Physical-chemical methods of experimental research	Physical–Chemical Analytical Methods of Compounds			5	
Concentration in Organic chemistry						
13	Analysis of Organic Compounds	does not have		5		13
14	Chemistry of hydrocarbons functional derivatives	Chemistry of Hydrocarbons		5		14
15	Chemistry of Heterocyclic Compounds	Chemistry of Hydrocarbons		5		15
16	Chemistry of Intermediate Organic Compounds	Chemistry of hydrocarbons functional derivatives, Chemistry of Heterocyclic Compounds			5	16
17	The Chemistry of Synthetic dyes	Chemistry of			4	

		hydrocarbons functional derivatives, Chemistry of Heterocyclic Compounds				
18	Chemistry of Organoelement compounds	Chemistry of hydrocarbons functional derivatives, Chemistry of Heterocyclic Compounds			6	
19	Modern approaches to polymer synthesis	Physics and Chemistry of functional derivatives of hydrocarbons, Physics and Chemistry of Macromolecules			5	
Research component:						
	Completion and defense of the master's thesis	learning components				30
Concentration in Physical chemistry						
20	Phases Equilibrium	Physical and Colloid Chemistry for magistrates		5		
21	Foundations of Solutions Theory	Theoretical Inorganic Chemistry		5		
22	Chemical Thermodynamics	Physical and Colloid Chemistry for magistrates		5		
23	Formal and Molecular Kinetics	does not have			5	
24	Foundations of Inorganic Crystal Chemistry	Physical and Colloid Chemistry for magistrates			5	
25	Solid body chemistry	does not have			5	
26	Theoretical Bases of Computer Modeling of Multi-Component Systems	Physical and Colloid Chemistry for magistrates			5	
20	Phases Equilibrium	Physical and Colloid Chemistry for magistrates		5		
Research component:						

	Completion and defense of the master's thesis	learning components				30
Concentration in Inorganic chemistry						
28	Theoretical Principles of Coordination Chemistry	Theoretical Inorganic Chemistry		5		
29	Quantitative Analysis for Magistrates	Theoretical Analitical Chemistry		5		
30	Instrumental Analysis for magistrates	Physical–Chemical Analytical Methods of Compounds			5	
31	Synthesis of Inorganic Substances	Theoretical Principles of Coordination Chemistry			5	
32	Theoretical Principles of Inorganic Chemistry – Chemistry of d- and f- Elements	Theoretical Inorganic Chemistry			5	
33	Chromatographic Analysis Method of Substances	Physical–Chemical Analytical Methods of Compounds			5	
28	Theoretical Principles of Coordination Chemistry	Theoretical Inorganic Chemistry		5		
31	Practice in cosmetology	Natural raw materials in therapeutic and preventive cosmetics, Dermatology			**10**	
Research component:						
	Completion and defense of the master's thesis	learning components				30
		in the semester:	**30**	**30**	**30**	**30**
		in the year:	**60**		**60**	
		all:	**120**			

Curriculum of the program

№	Course Identification Code	Learning Course	ECTS Credit/Hours	Hours								
				Lecture	Seminar (work in the group)	Practical classes	Laboratory	Practice	Course work/project	Mid-semester exam	Final exam	Independent work
1	LEH16312G3-LP	Foreign Language for Business Communication	5/125	15		30				2	2	76
2	BUA36402G1-LB	Management of Entrepreneurial and Technological Innovations	5/125	15			30			1	2	77
3	PHS19404G1-LP ID: 9573	Theoretical Inorganic Chemistry	4/100	15		15				1	1	68
4	PHS81104G1-LP	Chemistry of Hydrocarbons	4/100	15		15				2	2	66
5	PHS80604G1-LS	Physical and Colloid Chemistry for magistrates	4/100	15	15					1	1	68
6	PHS10104G2-LP	Theoretical Analitical Chemistry	4/100	15		15				1	1	68
7	EDU20202G1-LS	Pedagogy	4/100	15	15					1	2	67
8	LEH12312G1-LP	Theory and Practice of specialized Translation (English)	5/125	15		30				2	2	76
9	PHS13404G2-LS, ID: 7765	Physics and Chemistry of Macromolecules	5/125	15	30					1	2	77
10	PHS19304G1-LR ID: 9574	Physical–Chemical Analytical Methods of	5/125	15				30		1	1	78
11	PHS19804G1-LP ID: 9568	Mechanisms in Organic Chemistry	5/125	15		30				2	2	76
12	PHS81704G1-LS ID: 9578	Physical-chemical methods of experimental research	5/125	15	24		6			1	1	78
	Concentration in Organic chemistry											

13	PHS80904G1-LP ID: 9571	Analysis of Organic Compounds	5/125	15		30				1	2	77
14	PHS81204G1-LP	Chemistry of hydrocarbons functional derivatives	5/125	15		30				2	2	76
15	PHS80804G1-LP	Chemistry of Heterocyclic Compounds	5/125	15		30				1	2	77
16	PHS19904G1-LP ID: 9570	Chemistry of Intermediate Organic Compounds	5/125	15		30				1	2	77
17	PHS80504G1-LP	The Chemistry of Synthetic dyes	4/100	15		15				1	2	67
18	PHS12704G2-LPB ID: 9569	Chemistry of Organoelement compounds	6/150	20		20	20			1	2	87
19	PHS15204G2-LB ID: 9566	Modern approaches to polymer synthesis	5/125	15			30			1	2	77
	Concentration in Physical chemistry											
20	PHS80104G1-LS	Phases Equilibrium	5/125	15	30					1	2	77
21	PHS81404G1-LPB ID: 9575	Foundations of Solutions Theory	5/125	15		20	10			1	2	77
22	PHS80304G1-LP	Chemical Thermodynamics	5/125	15		30				1	1	
23	PHS81304G1-LP	Formal and Molecular	5/125	15		30				1	1	78
24	PHS80204G1-LP ID: 9577	Foundations of Inorganic Crystal Chemistry	5/125	15		30				1	2	77
25	PHS81504G1-LS	Solid body chemistry	5/125	15	30					1	1	78
26	PHS81604G1-LP ID: 9576	Theoretical Bases of Computer Modeling of Multi-Component Systems	5/125	15		30				1	1	78
	Concentration in Inorganic chemistry											
27	PHS19104G1-LP	Theoretical Principles of Inorganic Chemistry – Chemistry of s- and p-Elements	5/125	15		30				1	1	78
28	PHS19704G1-LP	Theoretical Principles of Coordination Chemistry	5/125	15		30				1	2	77
29	PHS80404G1-LB	Quantitative Analysis for Magistrates	5/125	15			30			2	2	76
30	PHS19604G1-LR ID: 9572	Instrumental Analysis for magistrates	5/125	15				30		1	2	77
31	PHS19204G1-LB	Synthesis of Inorganic Substances	5/125	15			30			2	2	76
32	PHS19004G1-LP	Theoretical Principles of Inorganic Chemistry –	5/125	15		30					1	
33	PHS80704G1-LP	Chromatographic Analysis Method of Substances	5/125	15		30				1	1	78

Head/Heads — Zurab Geliashvili, Irine Berdzenishvili

Chemical technology and metallurgy
Faculty quality assurance
head of the service — Mamuka Maisuradze

Accepted
Chemical technology and metallurgy
at the meeting of the faculty council
May 17, 2013

Dean of the Faculty — Nugzar Tsereteli

Agreed upon
Quality Assurance of Technical University of Georgia
at work — David Makhviladze

Approved by
Chemical Technology and Metallurgy
At the Session of the Faculty Council
22/ December/ 2022
Chairman of the Faculty Council — Nugzar Tsereteli