



Curriculum

Program title	Engineering Technologies and Systems
Qualification/academic degree to be awarded:	Doctor of Engineering in Industrial Engineering and Technology – 0719
Faculty name	Faculty of Technical Engineering
Program Manager / Administrators:	Professor Omar Kikvdze 593 375114
Duration / volume of the program (semester, number of credits):	The duration of the program is 6 semesters and consists of the course and research components. The volume of the course component is 45 credits (one credit - 25 astronomical hours). The course component is completed in the I, II, III semesters, and the research component - in the II, III, IV, V, VI semesters. The course component includes: - General courses and seminars (30 credits) - Elective courses in the direction of research topics (15 credits)
Language of instruction:	Georgian
Program development and renewal dates:	Accreditation decision: No. 160 - 09.07.2019 Resolution of the Academic Council No. 5 (23/24), 14.09.2023
Prerequisites (requirements) for admission to the program:	
The minimum requirements for admission to the doctoral program are: 1. Master's degree or an equivalent graduate specialist academic degree in engineering; 2. Passing the university exam in the direction of the research topic; 3. Knowledge of the English language at B2 level (passing the exam at the ATSU or presenting an appropriate certificate). In addition, the specific conditions are determined by the Resolution No. 1 of the Academic Council of ATSU of September 5, 2007 “On determining the basic principles of conducting doctoral studies at Akaki Tsereteli State University” (http://www.atsu.edu.ge/geo/gancxadebebi/doctorantura.pdf) In exceptional cases, if the applicant has practical and/or research work experience in the field (which is confirmed by documents, relevant papers or in another form), depending on the interdisciplinary topic of the future doctoral thesis research and on the recommendation of the head of the educational program, the meeting of the Faculty's Dissertation Council is to determine the applicant's compliance with the prerequisites for admission to the program. which is აკადემიური by the relevant protocol. Entrance exams are conducted in written form in a foreign language and in the relevant direction of the research topic. In the case of a competition, on equal points, the following criteria are decisive: evaluation of the applicant's master's thesis, published works and participation in scientific conferences.	
Program aims:	
The aim of the program is to train highly qualified specialists in the field of engineering, who are expected to be able to identify and solve problems in the field of engineering based on scientific research, create and analyze new calculation models, determine and optimize the parameters of engineering technological processes and technical systems, as well as scientific and pedagogical activity.	
Learning Outcomes (General and Sectoral Competencies):	
Knowledge and understanding:	The graduate is expected: 1. To critically analyze information in the scientific literature. Based on his/her own research, he/she describes the latest achievements in the field, modern methods and techniques of research and teaching. 2. To link the processes of creation of engineering systems, development of technological processes, scientific research and numerical analysis.
Skill	The graduate is expected: 3. To use the fundamental laws of nature, modern computer technologies in scientific research and solving engineering problems; 4. To determine parameters of engineering systems and technological processes based on mathematical modeling; 5. To use modern achievements of science and advanced technology in scientific research work; 6. To draw conclusions and work out practical recommendations on the reliability of engineering systems and the reliability of the main parameters of technological processes, based on scientific research; 7. To draw conclusion on the relevance of the research project; 8. To discuss and present the research findings (including in a foreign language) in the reports,

abstracts, scientific publications and during public hearings.

Responsibility and autonomy:

The graduate is expected:

9. To plan independently the process of professional growth, through the ability to learn and solving the complex issues;
10. To adhere to the principles of academic integrity and ethics of scientific research, struggle with plagiarism and unreasonable results;
11. Independently To identify independently problems existing in the field and seeks their solutions, taking into account the principles of technogenic safety.

Teaching methods:

While achieving learning outcomes, modern techniques of interactive teaching are used and those basic activities that are included in the Doctoral Program curriculum. Particularly, transfer of theoretical material, discussion, case study, presentation, brainstorming and teamwork (collaborative teaching),

Training courses are studied on theoretical lessons as well as by independent work of Doctoral student (on the basis of using the recommended basic manuals, supplementary literature, as well as the Internet resources). The purpose of theoretical lessons is to review the basic topics under the educational program and provide Doctoral student with relevant information. The lecture courses are aimed at theoretical study of branch and studying the essential facts accumulated in the mentioned field.

Seminar classes envisages a thorough elaboration of the matter under consideration and preparation of presentation. For the seminar presentations, there are selected problematic issues, elaboration of which requires conceptualizing of acquired knowledge during lectures, review and analysis of the indicated literature and other sources of information and identifying own position regarding the matter. During seminar classes, it is necessary to assess the adequacy of perception of the selected topic and/or independently prepared material by Doctoral student. Participants in the seminar include the leading teachers engaged in the educational programs, scientific advisors of the dissertation papers, and Doctoral students. The seminar paper of Doctoral student cannot be a part of Doctoral thesis. Other conditions are established in compliance with the regulations of the Faculty's Academic Council.

Some kind of monitoring over execution of Doctoral thesis is carried out during the **colloquiums**. The paper to be presented to the colloquium is a part of Doctoral thesis. Doctoral student submits to the program's leader (scientific advisor) the printed and electronic versions of paper to be presented to the colloquium. The printed copies of paper are to be sent out for review to person/persons having appropriate academic degree and qualification or to recognized industry experts.

Practice. Doctoral program envisages the completion of educational practice (assistance to Professor) with direct participation of scientific advisor and representative of the faculty of Pedagogics and/or recognized industry expert. This aims to give Doctoral student as much support as possible to become a future teacher and to develop relevant skills.

Program structure

According to the Law of Georgia on Higher Education, doctoral studies are the third level of higher education. The doctoral program includes the course and research components. In order to obtain the academic degree of PhD, the PhD student must complete the course and research components.

The course component of the doctoral program amounts to 45 credits distributed in the I, II, III semesters, and the research component - in the II-VI semesters.

1. The research component amounts to 45 credits:

- General courses and seminar classes – 30 credits (I, II semesters)
- Concentration elective courses - 15 credits (I, II semesters)

2. Research component - 135 credits (III-VI semesters)

The research component includes: publishing scientific articles related to the topic of dissertation and participation in the conferences; completion of no less than 2 colloquiums by Doctoral student; completion and defense of Doctoral thesis. Defense of Doctoral thesis, in its turn, involves the expertise of dissertation paper, reviewing and public discussions at the Dissertation Commission.

Prerequisites for presentation of Doctoral thesis to the public discussions before the Dissertation Commission are as follows:

1. Submission of a spreadsheet confirming earning 60 credits envisaged for educational component to the Faculty's Dissertation Council. This spreadsheet is issued by Office of Doctoral Studies, and it is signed by Rector and Head of Office.
2. Submission of a protocol of the completion of at least three colloquiums envisaged for educational component of the Doctoral program to the Faculty's Dissertation Council. The completion of colloquiums is confirmed by the certificate issued by Office of Doctoral Studies, which certifies the completion of at least three colloquiums and the assessments of colloquiums. This certificate is signed by rector of University and Head of Office of Doctoral Studies. Methodology for assessing these colloquiums is determined by the Order No 3 of 5 January 2017 of the Minister of Education and Science of Georgia (Article 4, paragraph 17. The assessment of the colloquium is considered positive, if he/she receives a), b), c), d) and e) assessments envisaged by this Article. In case of f) assessment, Doctoral student has the right to pass the revised version of the same colloquium in the next semester, but in case of g) assessment. Doctoral student must redo the colloquium.
3. At least 3 publications determined by the Faculty's Dissertation Council, in the editions approved by the Faculty's Dissertation Council, which are confirmed by submitting the article; the author of dissertation can also to submit a monograph. This monograph is a printed publication of description of problems relating to the dissertation topic, way to and methods to address them and the obtained results of research, in journals and books with ISBN, ISSN codes, such as: Messenger of Georgian Academy of Sciences, Messenger of Akaki Tsereteli State University, Georgian Engineering News,

collected papers of Georgian Technical University, Problems of Mechanics (Tbilisi), collected papers of the state universities of the Baltic countries, Problems of Metallurgy, Welding and material Science (Tbilisi), International Journal of Mechanical Sciences, Transaction of the American Society of Mechanical Engineers, Problems of Mechanical Engineering and Reliability of Machines (Moscow), Mechanical Engineering and Engineering Education (Moscow), Industrial Laboratory (Moscow), Mechanics of Solids (Moscow), News of Higher Educational Institutions. Mechanical Engineering (Moscow), News of Higher Educational Institutions. Energy (Moscow), Measurement Technology (Moscow), Messenger of Lomonosov State University (Moscow), Mechanical Engineering Messenger (Moscow), Metallurgical Science and Thermal treatment of Metals (Moscow), Strength Problems (Kiev), Applied Mechanics (Kiev), journals listed in a Scopus database, high-rated impact-factor journals ($>0,3$)

Participation in the conferences, the number of which is determined by the Faculty's Dissertation Council and making presentation relating to the topic of dissertation paper, which is confirmed by publishing relevant papers in the proceedings of international conferences, symposia and congresses, and presenting them at the Annual Conferences of Georgian Mechanical Union, Georgian-Polish International Scientific-Technical Conference, Proceedings of the International Conference on Contemporary Problems of Architecture and Construction, International Scientific Conference VIBRATION, International Conference on Non-Classical Problems of Mechanics, Current Issues of Energy, Problems Related to Continuum Mechanics, Proceedings of The conference of Young Scientists of the Institute of Machine Science, and in the international scientific forums organized by the state universities and research institutes of Georgia, CIS and Baltic States.

5. The conclusion of the PhD student's scientific advisor on whether the work is ready for public discussion (Academic Council Decree №62 17/18 1.03.2018 Art.18; paragraph 3);
6. Review of the completed dissertation paper at a special meeting of the Department;
7. Provision of official experts by the Faculty's Dissertation Council, who are to be presented to Rector for approval; the number of official experts and content of their work are determined in accordance with Regulation No 1 (Article 19) of 5 September.
8. In case of positive assessment from official experts, 2 or 3 reviewers are provided by the Faculty's Dissertation Council, who are to be presented to Rector for approval; decision on whom to appoint as official reviewers is made in accordance with Regulation No 1 (Article 20) of 5 September 2007 of the Academic Council of Akaki Tsereteli State University, and Resolution No 40(14/15) of 22 December 2014 of the Academic Council of Akaki Tsereteli State University; if more than half the reviewers assess dissertation negatively, Doctoral student is not permitted to defend his/her dissertation; if one of two reviewers makes negative conclusion on dissertation paper, the Dissertation Council is to provide the third reviewer within a period of 10 days.
9. In case of positive assessment from official reviewers, Doctoral student is permitted to present publicly dissertation to the Dissertation Commission provided by the the Faculty's Dissertation Council. The Dissertation Commission provided by the the Faculty's Dissertation Council is presented to Rector for approval; the composition of the Dissertation Commission is determined in accordance with Regulation No 1 (Article 21) of 5 September 2007 of the Academic Council of Akaki Tsereteli State University, Resolution No 17 (09/10) of 6 November 2009 of the Academic Council of Akaki Tsereteli State University and Resolution No 61 (14/15) of 7 May 2015 of the Academic Council of Akaki Tsereteli State University;
10. Rules for the assessment of dissertation paper are specified in paragraph 17 of article 4 of Order No 3 of 5 January 2007 of the Minister of Education and Science of Georgia, and in Resolution No 17 (09/10) of 6 November 2009 of the Academic Council of Akaki Tsereteli State University.
11. In case of successful completion of dissertation paper, the Faculty's Dissertation Council awards students the Doctor's academic degree(Resolution No 62 (17/18) of 1.03.2018, Article 25)and presents to Rector for approval the project awarding the Doctor's academic degree to Doctoral student.

See attached Appendix 1

Student Knowledge Assessment System

The common goal of the assessment system is to provide qualitative assessment of Doctoral student's performance of individual component of Doctoral program, taking into account consistency of the achieved results with the Program's objectives.

The basic principles of the assessment are as follows:

- the principle of transparency and publicity – accessibility to the assessment methods and criteria and providing preliminary information.
- the principle of equality and universality – ensuring a unified approach to each Doctoral student when assessing manifested knowledge, using uniform, predefined principles.

The assessment of Doctoral students performance is carried out in accordance with Order No 3 of 5 January 2007 of the Minister of Education and Science of Georgia (as amended), and in accordance with rules set by the Academic Council.

Within the educational component of educational program, the assessment system of Doctoral student performance envisages:

- a) Mid-term assessment.
- b) Activity assessment.
- c) Final examination assessment.

Maximum course assessment score is 100 points.

The maximum score for final examination is 40 points.

The minimum assessment score of students at Final Examination is 15 points.

Doctoral student has the right to take the final exam, if his/her minimum assessment score at mid-term examination is 18 points.

The course is considered completed, if the assessment total score of written tests is 51 points and over.

The students grading scheme includes:

a) five types of positive assessment:

(A) Excellent – 91-100 points.

(B) Very good – 81-90 points.

(C) Good – 71-80 points.

(D) Satisfactory – 61-70 points.

(E) Acceptable – 51-60 points.

b) two types of negative assessment:

FX) Student could not pass examination – 41-50 point that means that Doctoral student is required to work more for passing the exam, and that she/he is entitled to retake exam only once after individual work;

(F) failed to pass –40 points and lower that means that the work done by Doctoral student is not sufficient and she/he has to redo the course.

Within the educational component of the educational program, in case of FX assessment, a makeup exam is appointed no later than 5 days since the announcement of the examination results. The number of points received in a makeup examination is a final assessment score and is not added to the final assessment received by Doctoral student, and it will be reflected in final assessment of educational component. With account for the assessment received in educational component, in case of final assessment score 0-50 points, Doctoral student is assessed at F-0 point.

PhD student's performance assessment in separate disciplines can be made by different activities, such as: mid-term examination, final examination, execution of targeted written work, individual assignment and so on. The assessment criteria are different following from the specifics of separate disciplines as it set down in the appropriate Syllabuses.

The assessment of educational practice is carried out in accordance with an educational practice record list form adopted by Resolution No 76 (10/11) of 28April 2011 of the Academic Council of Akaki Tsereteli State University.

Seminar classes are assessed in accordance in accordance with a special mid-term exam and seminal record list adopted by the University.

The following assessment systems are used for the assessment of Doctoral student's dissertation paper:

a) Excellent (summa cum laude) –with highest honor.

b) Very good (magna cum laude) – with great honor;

c) Good (cum laude) – with outstanding honor.

d) Mean (bene) – meets all requirements;

e) Satisfactory (rite) – meets requirements, despite some shortcomings;

f) Unsatisfactory (insufficienter) – does not meet requirements because of substantial shortcomings;

g) Far from satisfactory (sub omni canone) – failed outright.

Fields of employment:

Graduates can be employed in:

- the university-based education system in the engineering field.
- industry enterprises.
- research institutions.
- expertise bureaus.
- the management bodies in engineering field.

Supporting conditions / resources necessary for learning

- Library of the Faculty of Technical Engineering, electronic library.
- For numerical calculations and studies, there exists the computer-based resource-center with appropriate software packages.
- Experimental studies will be carried out in the faculty's laboratories (Metrology of Processes and Apparatus, Materials Science, Material Mechanics, Metal Constructions, Welding Processes, Building Materials, material technological treatment processes, laboratory base of the Energy Department) and in the laboratories of partner organizations (Ferdinand Tavadze Institute of Metallurgy and Materials Science, R. Dvali Research Institute of Machines Mechanics).



საგარეო სახელმწიფო უნივერსიტეტი

Teaching Plan

Name of the Program: Engineering Technologies and Systems

Qualifications to be awarded: Doctor of Engineering in Industrial Engineering and Technology

	Course title			Cr	Workload in hours			l/pr/lab/gr	Semesters						Prerequisite for admission	
					Total	Contact hours			Ind	I	II	III	IV	V		VI
						Class hours	Mid term and final exams									
1	2			3	4	5	6	7	8	9	10	11	12	13	14	13
1			Course component– (105credits)													
1	General courses and seminar classes															
1.1	Modern teaching methods in engineering			5	125	30	2	93		5						
1.2	Teaching practice			5	125	30	2	93			5					1.1
1.3	Seminar 1			5	125	30	2	93			5					*
1.4	Seminar 2			5	125	30	2	93				5				*
1.5	Modern research methods in engineering			5	125	30	2	93		5						
1.6	Elective courses			5	125	45	3	77								
1.6.1	Project Risk Management (English-language course)			5		5		5								
1.6.2	Numerical methods in engineering			5		5		5								
	Totally			30						15	10	5				
	Research area elective courses									15						
2	Research area: Materials Engineering and Quality Control															
2.1	Physical Materials Science			5	125	30	2	93		5						
2.2	Innovative methods for obtaining materials			5	125	30	2	93		5						

	Course title	Cr	Workload in hours				l/pr/lab/gr	Semesters						Prerequisite for admission
			Total	Contact hours		Ind		I	II	III	IV	V	VI	
				Class hours	Mid term and final exams									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	13
2.3	Fundamentals of reliability of mechanical devices	5	125	30	2	93		5						
2.4	Tribological processes	5	125	30	2	93		5						
2.5	Modern methods and means of measurement	5	125	30	2	93		5						
2.6	Mathematical modeling of cutting processes and quality control	5	125	30	2	93		5						
3	Research area: Building Structures													
3.1	Mechanics of thin-walled spatial building structures	5	125	30	2	93		5						
3.2	Resource-saving technologies in construction	5	125	30	2	93		5						
3.3	Material creep and rupture	5	125	30	2	93		5						
3.4	Structural analysis models	5	125	30	2	93		5						
3.5	Finite element method in mechanics	5	125	30	2	93		5						
3.6	Thermal treatment of materials and structures	5	125	30	2	93		5						
3.7	Methods of optimization of highway parameters	5	125	30	2	93		5						
4.	Research area: Power Industry Technology and Management													
4.1	Theory of similarity and modeling (in relation to problems of electric power engineering)	5	125	30	2	93		5						
4.2	Planning and forecasting in power industry	5	125	30	2	93		5						
4.3	Fundamentals of energy security	5	125	30	2	93		5						
4.4	Models of Problem Solving (English-language course)	5	125	30	2	93		5						
4.5	Special modes of electrical systems	5	125	30	2	93		5						
4.6	Energy strategy	5	125	30	2	93		5						
5	Research area: Mathematical modeling of engineering processes and systems	5	125	30	2	93								
5.1	Continuum Mechanics	5	125	30	2	93		5						

	Course title	Cr	Workload in hours				l/pr/lab/gr	Semesters						Prerequisite for admission
			Total	Contact hours		Ind		I	II	III	IV	V	VI	
				Class hours	Mid term and final exams									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	13
5.2	Similarity and modeling theory	5	125	30	2	93		5						
5.3	General framework of mathematical modeling	5	125	30	2	93		5						
5.4	Finite element method in mechanics	5	125	30	2	93		5						
5.5	Mechanics of composites	5	125	30	2	93		5						
5.6	Material creep and rupture	5	125	30	2	93		5						
5.7	Mechanics of technological processes of materials processing	5	125	30	2	93		5						
5.8	Theory of mechanical vibrations	5	125	30	2	93		5						
5.9	Membrane technology	5	125	30	2	93		5						
Course component in total		45	1125					30	10	5				

* - The prerequisite for the seminar classes is the study course relevant to the seminar topic.