



საქართველოს ტექნიკური უნივერსიტეტი  
GEORGIAN TECHNICAL UNIVERSITY

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## Doctoral Education Program

### Program Title

Water Engineering

წყლის ინჟინერია

### Faculty

Civil Engineering

სამშენებლო

### Program Supervisor

Professor Alexander Bagration–Davitashvili

### Qualification to be Awarded

Doctor of Environmental Engineering and Safety

Will be awarded in the case of passing not less than 180 credits of an educational program.

### The Language of Teaching

English

### Admission Prerequisites to the Program

Has a Master's or equivalent academic degree. Considering: Existence of: scientific publications; Participation in scientific conferences; Other documents and materials related to studying/ research activities (certificates, diplomas, patents, etc.).

If the applicant submits the certificate confirming B2 level knowledge of English language, it is exempt from the test in a English. Otherwise, it is required to pass testing in English language in the computer center of GTU.

Compliance with a doctoral candidate for doctoral program is established by the Faculty Temporary Commission GTU's Regulations about Doctoral Council Doctorate Studies, Please see it in the link:

[http://gtu.ge/Study-Dep/Files/Pdf/doqtorantura\\_debuleb\\_2014.10.14\\_SD.pdf](http://gtu.ge/Study-Dep/Files/Pdf/doqtorantura_debuleb_2014.10.14_SD.pdf)

## Program Description

Program was developed according ECTS system, 1 credit is equal to 25 hours, which is meant as a contact, as well as independent work hours. The distribution of credits represented in the curriculum. The doctorate program includes 180 credits. During one academic year - 60 credits, 30 credits per semester; The student's annual workload may exceed 60 credits, but not more than 75 (ECTS) credit or less than 60 credits; Study component - 60 credits and research component 120 credits.

Doctoral Education Program Continues 3 years (6 semesters). The semester covers 20 weeks, the learning process takes place 15 weeks

The academic calendar will be published by GTU's Rector before the semester on the website.

The right to go to the final exam is given by the doctor who has fully fulfilled the prerequisites provided by the educational program and passed the minimum competency margin in the interim assessments. At the same time, the minimum amount of work defined by the program was passed.

In case of accumulation of the score of 41-50 points for the interim assessment and the final examination (FX evaluation can't be passed), or accumulating the total 51 or more points of the assessment, the doctorate is entitled to pass an additional examination during the same session. The interval between the conclusion and the addition test must be at least 5 days.

The number of points received in the final assessment is not added to the assessment received by the doctorate. The additional assessment is the final evaluation and will be reflected in the final assessment of the educational program component.

In case of non-excuse or inadequate scores on the final or additional examination, as well as non-compliance or timely interruption of the documentary material, the student will be able to evaluate the F-0 score and learn the subject from the beginning.

Assessment of the level of student learning results in each component of the program consists of intermediate assessments that involve current activity and midterm examination, and the final exam. Each component of the assessment has the minimum limit of competence defined by academic personnel and is set out in the syllabus.

**The program's Educational component** does not exceed 60 credits and consists of the following courses: Scientific Communication Technology and Teaching Methods - 5 Credits; Research Methods - 5 credits; Special courses related to Doctoral Program - 20 credits; Also the thematic seminar 1 - 15 credits; Thematic seminar 2 - 15 credits;

### **Compulsory Elements of the Doctorate Program Research Component:**

Research Project / Prospectus - 1 – 10 credits;

Research Project / Prospectus - 2 - 20 credits;

Theoretical / Experimental Research / Colloquium- 1 – 15 credits;

Theoretical / Experimental Research / Colloquium -2–15 credits;

Theoretical / Experimental Research / Colloquium - 3 – 30 credits;

Completion of the thesis, presentation– 30 credits.

It is inadmissible to complete other components parallel to "Completion and Protection of Thesis"

In the first semester of the first year Doctoral will study five training components:

Scientific communication techniques and modern teaching methods– 5 credits;

Research Methods– 5 credits;

Special courses related to Doctoral Program: – Water Systems Engineering 5 credits and Modern “Green” Technologies of Water Treatment 5 credits;

Research Project / Prospectus - 1 – 10 credits;

The first prospectus includes the development of scientific literature by the doctorate and the basic bibliography required for research, as well as the history of the study. Doctoral should briefly discuss what is currently being done and what is currently being done (who works and what direction). Prospectus should look at the novelty and actuality of the subject matter, logical explanation and justification of the scientific and theoretical / practical values of the selected topic.

Author should know what types of resources (literature, statistics) are based on and where to find this resource. Prospectus is evaluated simultaneously on the basis of 6 component by the supervisor of the doctorate.

The work is rated at a maximum of 100 points. Assessment Scaled Score (S) is obtained by formula  $S = 3.33 \times M$ , where M is the total score for all six components evaluation. The first Prospectus assessment criteria are: Explanation of the novelty of the topic and the justification - maximum score of 5 points; Explanation of the subject matter of the research topic and the justification - maximum score 5 points; Logical reasoning of scientific values of selected topic - maximum score of 5 points; Selected material, primary sources, scientific literature - maximum score 5 points; Theoretical / practical value of selected topic - maximum score 5 points; Ability to present topic - maximum score of 5 points. In the case of positive evaluation of the first prospectus (51 and more points), the doctoral student continues to study. In case of negative evaluation of the first prospectus (less than 51 points), the doctor will reiterate the work in accordance with the existing rule.

In the **second** semester of the first year of the course, the Doctoral will study three teaching components: Special Course - Environment and Sustainable Development - 5 credits, Water resources modeling - 5 credits and Research Project / Prospectus – 2 -20 credits.

The author of the **second prospectus** should have the idea of planned research and analysis methods.

The Doctoral must present a preliminary view / expectation about the expected results of the research in a logical manner. He should develop research problems, methodology and major issues of research. At this stage Doctoral should present the research plan of the thesis of the thesis.

The second prospectus is evaluated simultaneously by the doctor's head by 6 components. The second prospectus assessment criteria are: the originality of the research topic - the maximum score of 5 points; The importance of problem solving - maximum score 5 points; Estimated structure of the dissertation and schedule of performance - maximum score of 5 points; Methodology for Research in Dissertation Paper - Maximum Rate 5 Points; Estimation of the expected outcomes of the survey - maximum score of 5 points; Ability to present topic - maximum score of 5 points.

The first prospectus is the prerequisite for the second prospectus. In the case of positive evaluation of second prospectus (51 and more points), the doctoral student continues to study. In case of negative evaluation of second prospectus (less than 51 points), the doctor will reiterate the work according to the existing rule.

In the first and second semester of the second year of the course, the Doctoral will perform the first and second thematic seminars, each 15 credits.

The main goal of the **thematic seminar** is to teach Doctoral: to provide knowledge based on the latest

achievements of the specific field / subdivision within the relevant research community; Develop the ability to understand the problematic issues, correctly and efficiently solving the problem, analyze the new research and analytical approaches, criticize the issue and innovative methods, as well as in the thematic discussions

The subject of the seminar work is selected by the doctorate student in agreement with the doctorate. The theme of the seminar is dedicated to topical issues of the field / subdivision and it may not be a part of the dissertation topic. The Doctorate will present a seminar on the subject of the seminar on the basis of 4 components, evaluating the contents of the seminar. The work is rated at a maximum of 30 points. Evaluation Scaled Score (S) is obtained by the formula  $S = 1.5 \times M$  where M is the total score for all four components evaluation.

Intermediate evaluation criteria of the thematic seminar are: Access to the required information / maximum score - 5 points; Identification of the problem / maximum assessment - 5 points; Effectiveness / Maximum Appraisal of Information - 5 points; The system of research methods used / maximum evaluation - 5 points.

For the purpose of final assessment, the thematic seminars will be handed over to the Academic Department by the intermediate assessment of the supervisor, until the completion of the corresponding training semester (not later than the 15th week of the week). Dean organizes the workshop for presentation of the seminar. The workshop on the seminar is evaluated by a commission comprising 5-9 members, which is based on the submission of the head of the Dean Academic Department, the composition of the Commission is approved by the Faculty Council.

Representatives of academic personnel, invited professors and specialists of other institutions may be included in the commission. The Commission elects the chairman and the secretary from its composition. The date and place of the seminar should be placed on the faculty website and posted on a visible place a week before the seminar to allow anyone to attend. Each member of the Commission shall evaluate participation in the Seminar, its public presentation and discussion, with a maximum of 40 points based on 4 components.

The maximum evaluation of thematic seminars is 40 points. The final score is determined by the average arithmetic of scores written by all members of the commission (the total number of scores calculated on the number of appraisers divided). Scoring scores (S) of evaluation will be obtained with the formula  $S = 2 \times M$ , where M is the total score for all four component estimates.

The final evaluation criteria of the thematic seminar are: Critical assessment of information and its sources, maximum rating - 5 points; Conclusions and Results, Maximum Appraisal - 5 Points; Quality of survey conducted, maximum score - 5 points; Ability to present topic, maximum rating - 5 points. Each thematic seminar of doctorate is rated at a maximum of 100 points, intermediate and final score points.

In case of positive evaluation of the seminar 1 (51 and more points), the doctoral student continues to study.

In case of negative evaluation of thematic seminar-1 (less than 51 points), the doctor will reiterate the work according to the existing rule.

The thematic Seminar 1 is the prerequisite to go through thematic seminar 2.

During the second year of study (in the third and fourth semesters) the PhD student prepares two theoretical / experimental research / colloquium for each 15 credits.

The work is to be a part of the thesis. Colloquium presents the presentation and presentation of the doctoral material related to the dissertation topic / part thereof.

The aim of colloquial is to systemize the doctorate knowledge, presentation of the work, presenting the doctorate's creative thinking, the ability to communicate with the scientific community; Colloquial should reflect the justified results of theoretical / experimental research.

In the colloquium, the doctorate should demonstrate the specific question (quality of research) of the volume and depth, from the results obtained based on the research carried out by the researches and

to determine the further direction of the work. Display the expected results of the publication published in the prepared or refined journals for publication. Each member of the commission estimates the colony based on 6 criteria.

The colloquial assessment criteria are: Comparison of the methods and direction of the research conducted at the given stage with the problem - maximum score 5 points; Quality of research conducted at this stage - maximum score of 5 points; Conclusion on the basis of the research conducted at the given stage - maximum score of 5 points; Determination of the further direction of the survey - maximum score of 5 points; Labor analysis prepared for publication - maximum score of 5 points; Ability to present topic - maximum score of 5 points. The work is rated at a maximum of 100 points.

Assessment Scaled Score (S) is obtained by formula  $S = 3.33 \times M$ , where M is the total score for all six components evaluation. In case of each colloquy positive evaluation (51 and more points), the doctoral student continues to study. In case of colloquial negative assessment (less than 51 points), the doctoral will reiterate the work according to the existing rule. Colloquium-1 is the prerequisite to go through the Colloquium - 2.

In the first semester of the third year of studding: Theoretical / Experimental Research / Colloquium - 3 - 30 credits.

After receiving a positive assessment with the supervisor, the results obtained at the given stage of the study will be submitted to the Academic Department in the form of Colloquium-3 for their presentation. The dean is formed by a chairperson of the academic department, comprising a group of 5-7 members comprising representatives of the field academic personnel. The composition of the Commission is approved by the Order of the Council. The work of the Commission should also be attended by the supervisor of Doctoral. The doctoral present to the Commission the results obtained at the given stage of the study. Each member of the commission estimates the colony based on 6 criteria.

The colloquial assessment criteria are: Comparison of the methods and direction of the research conducted at the given stage with the problem - maximum score 5 points; Quality of research conducted at this stage - maximum score of 5 points; Conclusion on the basis of the research conducted at the given stage - maximum score of 5 points; Determination of the further direction of the survey - maximum score of 5 points; Labor analysis prepared for published or publication - maximum score of 5 points; Ability to present topic - maximum score of 5 points. The work is rated at a maximum of 100 points.

Assessment Scaled Score (S) is obtained by formula  $S = 3.33 \times M$ , where M is the total score for all six components evaluation. In case of colloquial positive assessment (51 and more points), doctoral continues to study. In case of colloquial negative assessment (less than 51 points), the doctoral will reiterate the work according to the existing rule. Colloquium-2 is the prerequisite for the Colloquium -3.

Second semester of the third year ofstuding: completion of dissertation, presentation - 30 credits.

Completion and presentation of the thesis is a major part of the research component. The completed thesis should be the result of independent doctoral research work. It should reflect the scientifically justified new results of the theoretical / experimental research conducted by the doctorate and / or solve the acute scientific problem. It should be characterized by scientific innovation and contributing to the field development. The work should be presented in the research in the scientific level, the research quality, scientific research results of the consistency and reliability of financial data (if any), the methods (methodology), the work of theoretical / practical value, humanitarian sectors thesis special feature of the new literary water Discoveries and their introduction in scientific circulation (e.g. epigraphic monuments; lexicographical studies; manuscripts and critical studies of their texts; archival data; field data of archaeological, ethnological and linguistic studies; newly established facts of collections of museum and savings institutions).

The doctorate's thesis can be deduced from the Dissertation Board (including 30% of the Dissertation Board) or the University Dissertation Board, which is comprised of 7-9 representatives of the PhD program relevant to the Doctoral Program:

Assessment of scientific-research component / component of Doctoral Education Program is evaluated simultaneously with the final assessment.

The assessment system of scientific-research component / component of Doctoral Education program is:

- a) Excellent (*summa cum laude*) – Excellent work
- b) Very good (*magna cum laude*) - result that exceeds the requirements in every way;
- c) Good (*cum laude*) - result that exceeds the requirements;
- d) Average (*bene*) - result that meets the requirements in every way;
- e) Satisfactory (*rite*) - a result that, despite the shortcomings, still meets the requirements;
- f) Unsatisfactory (*insufficient*) - a result that does not meet the requirements due to significant deficiencies;
- g) Completely unsatisfactory (*sub omni canone*) - a result that does not meet the requirements completely.

The nominees will be accepted by the relevant Commission / Collegiate / University Dissertation Board members according to established criteria, according to the average arithmetic of points (0-100) confidential.

In case of unsatisfactory assessment, the doctorate will be entitled to submit the dissertation thesis within one year, and in case of receiving a totally unsatisfactory (*sub omni canone*) assessment the doctor will lose the right to present the same dissertation work;

The nominations will be made according to the average arithmetic (0-100) points awarded by the members of the respective Collegiate / University Dissertation Board in accordance with the following criteria: Actuality of the Dissertation Community - Rate to 15 Points; News of the dissertation thesis - evaluation to 18 points; Theoretical / practical value of the dissertation thesis - evaluation to 18 points; Presentation of the problem in the dissertation work and its solution - evaluation to 25 points; Answers to questions - up to 18 points; Visual performance of the material - up to 6 points.

Doctoralist is obliged to publish at least three scientific articles and take part in a scientific conference (to make a personal report) before the doctoral studies are presented to the Dissertation Board. The articles should reflect the main findings of the scientific research performed by the doctorate on Dissertation.

Scientific articles should be published in the publications recognized by the Dissertation Board and the editorial-publishing board of the GTU, or in the field of scientific journals that are spread internationally and are referenced in one of the international referral journals. Doctorate is published as a publication if the relevant volume of the magazine is already printed or the work is on the official website of the magazine. All articles must be published in a single magazine issue.

#### **Preliminary presentation of the Thesis:**

The prerequisite for presenting the thesis, together with other requirements defined by the Doctoral Department of the Technical University, is the component - "Completion and Protection of Dissertation" Preliminary presentation of the Dissertation Work at the Extended Session of the Academic Department on which it is appropriate to invite qualified professionals of the respective field.

The doctorate will report the main provisions of his work and the results obtained, clearly articulates the actuality of the dissertation, scientific innovation, practical value, the problem presented in the dissertation work and ways of solving it. The doctoral student answers the questions asked by the participants. At the pre-presentation doctorate can use any type of audio / visual material; Preliminary presentation results are recorded in the protocol.

The Georgian Technical University's Dissertation Board and Doctoral Studies are available at the University website, at:

[http://gtu.ge/Study-Dep/Files/Pdf/doqtorantura\\_debuleb\\_2014.10.14\\_SD.pdf](http://gtu.ge/Study-Dep/Files/Pdf/doqtorantura_debuleb_2014.10.14_SD.pdf)

The procedure for approval of Scientific Leaders and Dissertation Issues is given at the University website: [http://gtu.ge/Learning/pdf/doqtoranturis\\_debuleb2017.pdf](http://gtu.ge/Learning/pdf/doqtoranturis_debuleb2017.pdf)

Personal doctoral work plan is given on the following address:

[http://gtu.ge/pdf/doqtor\\_deb\\_danarTebi2.pdf](http://gtu.ge/pdf/doqtor_deb_danarTebi2.pdf)

### **Program Objective**

Prepare a modern competitive water resources engineer, activity-oriented in design, research, practice and exploitation; who will be able provide design and operational works of water bodies maintaining construction norms and rules, based on the knowledge of most recent developments and innovative methods. Will be able independently provide planning, implementation and supervision of Innovative Research, clearly and soundly demonstrate a new knowledge of Water Engineering in conjunction with existent knowledge and involve in thematic debates with the international scientific community. Will be motivated to a worthy contribution to the socio-economic development from the professional point of view. Will be able provide the critical analysis, synthesis and evaluation of new, complex and controversial ideas, preplanning and development of new methodologies.

### **The Learning Outcomes/Competence (general and field-specific)**

#### **Knowledge and understanding**

- Have knowledge based on the latest achievements in the field of Environmental engineering and safety. Knows the modern Environmental technologies and their applications;
- Knows utilisation of innovative methods of rational usage and protection of water resources;
- Knows modern alternative decision making approaches according to consumer's requirements;
- Knows innovative methods for implementation of the engineering project; independent develop project management plan;
- Knows how to create reliable models for water distribution, groundwater and watersheds using of modern engineering program RIBASIM;
- Knows the relationships of cultural, economic, social, political and organisational factors with technical factors and their impact on project outcomes and instability of policies;
- Have the knowledge and understanding of the theory of similarity and dimensions; histogram construction modern methods of Database tables;
- Knows the revised methodology for providing and processing of experiments;
- Has ability of understanding renewable bounds of knowledge by renovate analysis and partial reevaluation of modern teaching and learning methods.

#### **Applying knowledge**

- Can independently provide innovative research policy and strategy for planning implementation and supervision Environmental engineering and safety projects;
- Can to develop new research and analytical methods and approaches, which are oriented on the creation of new knowledge and are reflected in international refereed publications;
- Can be used mechanical-mathematical methods research, providing experiments, and process the results;
- Can independently plan, conduct, provide prevention and treatment and supervise-controlling of water supply works; Develop modern research and analytical methods and approaches;

- Can build models using RIBASIM and through them regulate river basin;
- Can independently develop, implement and manage of the engineering projects;
- Able to use received knowledge in teaching and guidance of student's scientific-research works using analytical methods and approaches.

**Making judgments**

- Can provide a new, complex and controversial ideas and approaches to critical analysis, synthesis and evaluation in the rapidly developing field of Environmental engineering and safety, supports the elaboration / development of a new methodology.
- Can make a critical analysis of the information obtained as a result of scientific-research, collation and synthesis of achieved results, forming reasoned conclusions;
- Can provide critical analysis of the new and complex engineering data and approaches and indecently make right decisions for solving the problem.

**Communication skills**

- Can to present own conclusions and arguments of water engineering within academic and professional society;
- Can to engage in thematic debates with international scientific community;
- Can presented scientific potential and research results reasoned and clearly;
- Can make a target public speech within different types of to the audience, including presentation and interpersonal communications with international scientific community, take part in thematic debates;
- Can represent technical report of own opinions reasoned and clearly during technical design process;
- Will be able clearly present the project gradual progress reports and project proposals within wide scientific-technical audience;

**Learning skills**

- Has readiness based on the most recent achievements to develop new ideas or processes of learning and activities, including research process in the rapidly developing field of Environmental engineering and safety;
- During learning and research processes can develop/generate innovative ideas based on the most recent scientific achievements.

**Values**

- Has a commitment to professional conduct and ethical responsibility of the engineer;
- Research of the new ways for inculcation of science, as our new social and scientific values and establish the innovative methods for this values.

**Methods (teaching - learning) of Achieving Learning Outcomes**

- Lecture  
  Practical  
  Seminar (work in group)  
  Laboratory  
  Scientific-Thematic Seminar  
 Independent Work  
  Research component  
  Consultation  
  Design of



**Teaching methods.** during studying process the following methods are used to study the specifics of the course, which is given in the syllabi of the course;

1. **Discussion/debates.** This is the most widely spread method of interactive teaching. A discussion process greatly increases the quality of students' involvement and their activity. A discussion may turn into an argument and this process is not merely confined to the questions posed by the teacher. It develops students' skills of reasoning and substantiating their own ideas.
2. **Case study** – the teacher discusses concrete cases together with the students and they study the issue thoroughly. E.g., in the sphere of engineering safety it can be a discussion of a concrete accident or catastrophe, or in political science it can be a study of a concrete, e.g., Karabakh problem (Armenian-Azeri conflict).
3. **Demonstration method** implies presenting information with the help of visual aids. It is quite effective in reaching the required result. It is frequently advisable to present the material simultaneously through audio and visual means. The material can be presented both by a teacher and a student. This method helps us to make different steps of perceiving the teaching material more obvious, specify what steps the students are supposed to take independently; at the same time this strategy visually shows the essence of an issue/problem. Demonstration can be very simple.
4. **Verbal or oral method** comprises a lecture, narration, conversation, etc. During the process the teacher conveys, explains the material verbally, and students perceive and learn it by comprehending and memorizing.
5. **Written method** implies the following forms of activity: copying, taking notes, composing theses, writing essays, etc.
6. **Practical methods** unite all the teaching forms that stimulate developing practical skills in students. In this case a student independently performs different kinds of activity on the basis of the knowledge acquired.
7. **Explanatory method** is based on discussing a given issue. In the process of explaining the material the teacher brings concrete examples the detailed analysis of which is made in the framework of the given topic.
8. **Activity-oriented teaching** implies teachers' and students' active involvement in the teaching process, when practical interpretation of the theoretical material takes place.
9. **Collaborative work;** using this method implies dividing students into separate groups and giving each group its own task. The group members work at their issues individually and at the same time share their opinions with the rest of the group. According to the problem raised, it is possible to shift the functions among the group members in this process. This strategy ensures the students' maximum involvement in the learning process.
10. **Induction** is such a form of transmitting any knowledge when the process of thinking in the course of the study is directed towards generalization, in other words when delivering the material the process is going from concrete to general.
11. **Deduction** is such a form of transmitting any knowledge, which based on general knowledge represents logical process of discovering new knowledge in other words, the process is going from general to concrete.
12. **Analysis** helps us to divide the study material into constituent parts. This will simplify the detailed coverage of individual issues within a difficult problem.
13. **The synthesis** implies the composition of one whole by grouping individual issues. This activity contributes to the development of the problem to be seen as a whole.

## Student Knowledge Assessment System

Grading 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 and is given the right to take the exam once more 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

**Doctoral thesis** is to assess the 100-point system:

- a) Excellent (*summa cum laude*) – Excellent work
- b) Very good (*magna cum laude*) - result that exceeds the requirements in every way;
- c) Good (*cum laude*) - result that exceeds the requirements;
- d) Average (*bene*) - result that meets the requirements in every way;
- e) Satisfactory (*rite*) - a result that, despite the shortcomings, still meets the requirements;
- f) Unsatisfactory (*insufficient*) - a result that does not meet the requirements due to significant deficiencies;
- g) Completely unsatisfactory (*sub omni canone*) - a result that does not meet the requirements completely.

The corresponding forms and methods of assessment of students knowledge are present in syllabuses and the University web-page in the document "The evaluation procedure of educational and research components of Doctoral program ":

[http://gtu.ge/pdf/danarTi\\_3\\_Sefasebis\\_wesi\\_2.pdf](http://gtu.ge/pdf/danarTi_3_Sefasebis_wesi_2.pdf)

## Sphere of Employment

The graduates of the Water Engineering Doctoral program can work in government institutions, consulting firms and agencies, research and educational institutions, whose activities are related to innovation, creation of new knowledge and analytical approaches in the field of water and environmental engineering. Also, in international and local environmental organisations, relevant ministries and agencies; supervision and architecture institutions of Mayor's Office, municipalities; Cities utility services; in such companies, as „Georgian Water and Power Company” and “Georgian United Water Supply Company”. His official duty and its scope can be defined as a highly qualified scientific researcher or from manager at different levels to a high-ranking executive.

## Human and material resources necessary for the implementation of the program

**The program provides the appropriate human and material resources.**

Doctoral program provided at the Faculty of Civil Engineering of Georgian Technical University maintained by the following material and technical resources:

1. Lectures and studying classes;
2. Computer Center with the appropriate software;
3. Virtual laboratories;
4. The educational laboratory of pumps;
5. Building internal Plumbing Equipment Laboratory;
6. Hydraulics Laboratory;
7. Educational and scientific lab of the Civil Engineering Faculty;
8. The Faculty library.

**In Tsoetne Mirtsxulava Institute of Water Management:**

1. The laboratory of studying of hydraulic structures;
2. Pumping station;
3. Modern irrigation and drainage research facility;
4. hydrogeological and engineering geological laboratory;
5. The reservoir for 10 pieces determining the flow profile of of different shapes;
6. Laboratory for studies of soil and water chemical;
7. The laboratory for study of ground-soils;
8. Hydraulic device for flood modeling, 2 pieces;
9. River-bed processes Modeling Laboratory;
10. The laser device used to study erosion processes;
11. The object of the study bio-engineering events in the open nursery garden;
12. Sea coasts abrasive (erosive) processes and large-scale modeling smallscale machine.

**Program is provided by following academic staff (CV- s are attached):**

1. Levan Klimiashvili professor, Doctor of Technical Science;
2. Irakli Kruashvili, professor, Doctor of Technical Science;
3. Irina Khomeriki, professor, Doctor of Technical Science;
4. Irma Inashvili, professor, PhD;
5. Alexander Bagration–Davitashvili, professor, PhD.

**For more information see the attached documentation.**

**The Number of Syllabi Attached: 6**

### Courses in the Program

№	Learning component	Admission prerequisites	ECTS Credits		
			I Year	II Year	III Year
			Semester		

			I	II	III	IV	V	VI
1	Scientific Communication Techniques and the Modern Methods of Study	N/A	5					
2	Methods of Scientific Research and Their Use in Water Engineering	N/A	5					
3	Water Systems Engineering	N/A	5					
4	Modern “Green” Technologies of Water Treatment	N/A	5					
5	Environment and Sustainable Development	N/A		5				
6	Water Resources Modelling	N/A		5				
7	First Thematic Seminar	N/A			15			
8	Second Thematic Seminar	First Thematic Seminar				15		
<b>Research Component:</b>								
1	Thesis Research Project / Prospectus - 1	N/A	10					
2.	Thesis Research Project / Prospectus - 2	Thesis Research Project / Prospectus - 1		20				
3.	Theoretical / Experimental research / Colloquium - 1	Thesis Research Project / Prospectus - 2			15			
4.	Theoretical / Experimental research / Colloquium - 2	Theoretical / Experimental research / Colloquium - 1				15		
5.	Theoretical / Experimental research / Colloquium - 3	Theoretical / Experimental research / Colloquium - 2					30	
6.	Thesis Completion, Presentation	Theoretical / Experimental research / Colloquium - 3						30
<b>Total per year</b>			<b>60</b>		<b>60</b>		<b>60</b>	
<b>Total:</b>			<b>180</b>					

## Learning Outcomes Map

№	Learning component	Knowledge and understanding	Applying knowledge	Making judgments	Communication skills	Learning skills	Values
1	Scientific Communication Techniques and the Modern Methods of Study	X	X		X	X	X
2	Methods of Scientific Research and There Use in Water Engineering	X	X		X	X	X
3	Water Systems Engineering	X	X	X		X	X
4	Modern “Green” Technologies of Water Treatment	X	X	X			X
5	Environment and Sustainable Development	X	X	X			X
6	Water Resources Modelling	X	X		X	X	X
7	First Thematic Seminar	X	X	X	X	X	X
8	Second Thematic Seminar	X	X	X	X	X	X
<b>Research Component:</b>							
1	Thesis Research Project / Prospectus - 1	X	X	X	X	X	X
2.	Thesis Research Project / Prospectus - 2	X	X	X	X	X	X
3.	Theoretical / Experimental research / Colloquium - 1	X	X	X	X	X	X
4.	Theoretical / Experimental research / Colloquium - 2	X	X	X	X	X	X
5.	Theoretical / Experimental research / Colloquium - 3	X	X	X	X	X	X
6.	Thesis Completion, Presentation	X	X	X	X	X	X

## Program Curriculum

№	Course code	Learning component	ESTS credits / hours	Hours							
				Lecture	Seminar (work in the group)	Practical classes:	Laboratory	Practice	Mid-semester exam	Final exam	Independent work
1	LEH16508E1	Scientific Communication Techniques and the Modern Methods of Study	5/125	1/15	2/30	-	-		2	1	77
2	AAC96401E1	Methods of Scientific Research and Their Use in Water Engineering	5/125	1/15	-	2/30	-		2	1	77
3	AAC97401E1	Water Systems Engineering	5/125	1/15	-	2/30	-		2	1	77
4	AAC96501E1	Modern "Green" Technologies of Water Treatment	5/125	1/15	2/30	-	-		2	1	77
5	ENVSD01EA1	Environment and Sustainable Development	5/125	1/15	2/30	-	-		2	1	77
6	WRMOD01EA1	Water Resources Modelling	5/125	1/15	-	2/30	-		2	1	77

Program Supervisor

Alexander Bagration-Davitashvili

Faculty of Civil Engineering  
Head of Quality Assurance Service

Marina Javakhishvili

Dean of the Faculty

David Gurgenzidze

**Agreed with**

Quality Assurance Service of GTU

Irma Inashvili

**Approved by**

Faculty of Civil Engineering  
At the meeting of Faculty Board  
Protocol: N1.12.01.2015 year

**Modified**

Faculty of Civil Engineering  
At the meeting of Faculty Board  
N 25 30.03.2018  
Chairman of the Faculty Boar

David Gurgenidze