



საქართველოს ტექნიკური უნივერსიტეტი  
GEORGIAN TECHNICAL UNIVERSITY

**Approved by**  
Academic Council of GTU  
2014 25 June  
Order №1181

**Modified**  
Academic Council of GTU  
2018 2 April  
Order № 01-05-04/95

## Master's Educational Program

### Program Title

წყლის ინჟინერია

Water Engineering

### Faculty

სამშენებლო

Civil Engineering

### Program Supervisor

Professor Irma Inashvili

### Qualification to award

**Master of Construction in Specialization of Water Engineering**

Will be awarded in the case of passing not less than 120 credits of an educational program.

### The language of teaching

English

### Admission Prerequisites to the Program

The studying rights on a Master's program is entitled person who has at least a bachelor's or equivalent academic degree and has English knowledge in the level B2, that must be approved by appropriate Certificate from Institution with special Accreditation, or tests providing by the University. The person will be enrolled according the results of the Graduate Record Examination (based on the Graduate Record Examinations, and tests in specialty submitted in the English language). Sample tests will be posted up on the website of the Department of Education of GTU at least one month before the start of the examinations - <http://gtu.ge/study/index.php>. Admission to the Master's program without passing the examination may be established by the Ministry of Education and Science.

### Program Description

The 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 MA program includes 120 credits (ECTS). In the course of one academic year - 60 credits, 30 credits in the semester; The student's annual workload may exceed 60 credits, but not more

than 75 (ECTS) credits or less than 60 credits; Study component - 75 credits and research component 45 credits. The duration of Master's degree program is 2 years (4 semesters). The semester covers 20 weeks, from which the learning process takes place 15 weeks.

The Master is entitled to pass the final examination, which has fully fulfilled the pre-requisites envisaged 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.

If the student has scored 51 or more points but cannot pass the minimum limit of competency on the final exam, and if his semester assessment (sum assumed for interim assessment and final examination) is 41-50 points, the student is allowed to pass the exam once in the same sessions

The interval between the final and the addition test must be at least 5 days.

The scores obtained in the final assessment are not added to the assessment received by the Master's final score. The assessment on the addition of the exam is the final assessment and the final evaluation of the component of the educational program.

The assessment level of student learning results in each component of the program consists of intermediate assessments that involve current activity and midterm test and 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 study component** does not exceed 75 credits and consists of the following training courses:

**First semester:** Hydrology of Surface and Groundwater – 7 credits, Water Resources Assessment -5 credits, Water Quality Assessment – 5 credits, Water Resources Engineering -8 credits, elective courses: 1. Environmental Chemistry -5 credits and 2. Management of Design of Water Supply and Wastewater Systems -5 credits

**Second semester:** Water Resources Monitoring -7 credits, Environment Defense and Sustainable Development - 5 credits, Water Resources Planning -8 credits; Elective courses: 1. Strategic Operation Management for Competitive Advantage – 5 credits, 2. Decision Making and Quantitative Analysis for Management - 5 credits.

**Third semester:** Water Systems Modeling -8 credits, Integrated Water Resources Management -7 credits; elective courses: 1. Watershed Management 5 credits, Management in Engineering -5 credits.

**Program research component** does not exceed 45 credits and consists of the following components:

Master Research Project / Prospectus - 5 credits, II semester

Theoretical / Experimental Research / Colloquium - 10 credits, III semester

Completion and presentation of master thesis - 30 credits, IV semester

**Master Research Project / Prospectus** should look at the subject matter of the study, theoretical, practical value of the selected topic. The author should know what types of resources (literature, statistics) are based on and where to find this resource. Prospectus should include the results of processing the relevant literature and the necessary bibliography, as well as the history of the research. It should be briefly presented what is currently being done in this direction and what is currently being done (who works and what direction). The author should establish the main issues of the research, present a work plan.

The capacity of the Master Research Project - Prospectus should be approximately 8-10 pages without annexes.

#### **Theoretical / Experimental Research / Colloquium**

The main objective of the theoretical / experimental study is to develop independent work skills, to create a clear presentation of the theme of solving the main professional tasks, to acquire the modern methods of research, to establish and solve the issues raised during the work. In the scope of the study he is tasked to prepare one colloquium.

Colloquium providing presentation of the material related to the master topic / its parts. The main goal of the colloquium is to systemize the knowledge of the master's degree, presenting the results of the work, and the ability to communicate with the professional community. In the colloquium, the master must demonstrate the amount of the subject matter and the specific issue examined, to present the results.

The amount of the work to be published on the colloquium should be about 12-15 pages without annexes.

#### **Completion and presentation of master thesis (qualification work)**

The qualification work is a major part of the research component. The completed qualification work should be the result of independent research work of the Master. The qualification work should reflect the results obtained from the theoretical / experimental research. The amount of a master's thesis should be typically no less than 70 and not more than 100 pages.

For more information, see the following documents:

**Regulation of Georgian Technical University on Master's Degree-** <http://gtu.ge/Study->

[Dep/Files/Pdf/mag\\_debuleba\\_2017\\_SD.pdf](#)

**Undergraduate Personal plan**

[http://gtu.ge/Study-Dep/Files/Pdf/mag\\_deb\\_3%20danar\\_%20%2080817\\_SD.pdf](http://gtu.ge/Study-Dep/Files/Pdf/mag_deb_3%20danar_%20%2080817_SD.pdf)

**Rule of Evaluation of the Masters Educational Program Research Component**

[http://gtu.ge/Study-Dep/Files/Pdf/mag\\_deb\\_dan4\\_80217\\_SD.pdf](http://gtu.ge/Study-Dep/Files/Pdf/mag_deb_dan4_80217_SD.pdf)

**Instructions for submitting the paper for the Master's degree**

[http://gtu.ge/Study-Dep/Files/Pdf/magist\\_debuleba\\_dan5\\_2017\\_SD.pdf](http://gtu.ge/Study-Dep/Files/Pdf/magist_debuleba_dan5_2017_SD.pdf)

## **Program Objective**

To prepare the water resources engineer which will be modern requirement appropriate, competitive, performance-oriented, focused on the practical and operational activities. Which, will can provide design and implementation of operational activities given into construction norms and rules, will be motivated to be a professional point of view, a worthy contribution to the social - economic development. Will be able to design, construction and exploitation of water resources management systems using modern computer programs and consideration of risk-factors in the regulatory processes. Will be able to natural water classification, monitoring of water quality and assessment them use the modern standards.

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

### **Knowledge and understanding:**

Deep and systematic knowledge of hydrology and water resources management; Knowledge of physical, chemical, and biological characteristics of water typical pollutants; Knowledge and understanding of physiological, bacteriological and biological processes of water and quality requirements; Understanding the relationship between the technical and environmental issues; Knowledge of modern methods of ground-water research; Knowledge of technical skills of project management and the main design principles; Knowledge of engineering design and implementation stages of planning; Understanding the basic principles of economic activity and the conditions for their realization; Understanding the complex issues of monitoring; Knowledge of modern engineering computer programs “RIBASIM” and “WEAP”. Understanding the individual solution of the problems in the water engineering.

### **Applying knowledge:**

Independently planning, construction and exploitation of various water systems. The large scale data analysis and statistical processing of data in water engineering; Select the appropriate engineering solution and their use in practice; Independently solution of engineering tasks using “RIBASIM” and “WEAP” computer programs. Understanding, analysis and interpretation of hydrological data; Selected mechanical properties of engineering materials (characteristics) Experimental determination; Engineering tasks related to the implementation of engineering design; Specific engineering-practical tasks of logical schemes.

### **Making judgments:**

Has the ability of the abstract thinking, analysis, synthesis, identification of problems, questions, analyzing and establishing a reasonable inference ability of computer programs using engineering data collection, analysis and reasoned conclusions; Understanding the scope of work, error detection, error analysis of the relevant technical literature in support of these conclusions; Calculation and analysis of engineering structures based on reasoned conclusions; Protective measures for natural resources, engineering analysis and evaluation of alternatives; Adequate communication with the particular audience in order to make an appropriate judgment.

### **Communication skills:**

In the process of designing make clear conclusions through the oral presentation and writing technical reports, and discussion; Submission and presentation of the midterm technical reports to the wide audience; Submission of the oral presentations and written technical reports to the specialist and non-specialists in an acceptable manner; Obtain, processing and presentation of the information for the experts in laconic way using the modern information and communication techniques; Provision of the presentations to the target audience and carry out the interpersonal communication.

**Learning skills:**

Assessment of the personal learning process in a coherent and versatile way; After the completion of the educational program, development of the professional career, identification the further learning needs. Identification of the needs in personal learning process in the field of water governance; Finding the Learning means, understanding the learning characteristics of the process based on the strategic planning and management of future learning.

**Values:**

Professional ethics in accordance with the basic laws of action; Conductn the engineer's professional, ethical responsibility and values to promote the quest. Critical unpredictable situations in professional behavior and ethical norms of engineers; Participation in the formation of values, attitudes toward their quest for respect and promote.

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

Lecture  Seminar (work in group)  Practical  Laboratory  practice  Course paper / project   
Master's paper  Consultation  Independent work

Based on the specific course of study in the learning process, the relevant below listed activities of the teaching-learning methods are used, which are reflected in the relevant training courses (syllabus):

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. **Cooperative teaching** is a teaching strategy in the process of which each member of a group not only has to learn the subject himself, but also to help his fellow-student to learn it better. Each member of the group works at the problem until all of them master the issue.
3. **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.
4. **Problem-based learning (PBL)** is a method which uses a concrete problem as the initial stage both for acquiring new knowledge and integration process.
5. **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
6. **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.
7. **Analytical method** helps us to divide the whole teaching material into constituent parts. In this way the detailed interpretation of separate issues within the given complex problem is simplified.
8. **Synthetic method** implies forming one issue from several separate ones. This method helps students to develop the ability of seeing the problem as a whole.

9. **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.
10. **Written method** implies the following forms of activity: copying, taking notes, composing theses, writing essays.
11. **Laboratory method** implies the following forms of activity: conducting experiments, showing video materials.
12. **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 e.g. field study, teaching practice.
13. **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.
14. **Activity-oriented teaching** implies teachers' and students' active involvement in the teaching process, when practical interpretation of the theoretical material takes place.
15. **Designing and presenting a project.** While designing a project a student applies the knowledge and skills he has acquired for solving a problem. Teaching by means of designing projects increases students' motivation and responsibility. Working on a project involves the stages of planning, research, practical activity and presenting the results according to the chosen issue. The project is considered to be completed if its results are presented clearly, convincingly, and correctly. It can be carried out individually, in pairs or in groups; also, within the framework of one or several subjects (integration of subjects); on completion the project is presented to a large audience.

## 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.

The syllabuses of the courses include the relevant forms and methods of the evaluation of a student knowledge and descriptions of the methods, criteria and scales of the assessment relevant to the evaluation forms.

Assessment rule of the research component:

### **Prospectus evaluation**

Prospectus evaluation is being done by the mentor of the master only once (final assessment) by 4 components: The actuality, goals and expected practical value of the research topic; Literature review; Research methodology, Expected results of the research.

Prospectus assessment criteria:

1. **Actuality, Goals and Expected Practical Value of the Research Subject - Maximum 5 Points**  
 4-5 points - The actuality, goals and the expected practical value of the research topic are clearly and logically formed;  
 3-4 points - The actuality, goals and expected practical value of the research topic are logically formed, but lacks of clarity;  
 2-3 points - The actuality, goals and expected practical value of the research topic is formulated but not fully formulated

1-2 points - The actuality, goals and the expected practical value of the research topic are superficial and aren't reasoned

0-1 Points - The study of the topic, objectives and anticipated practical value of poorly formulated, without taking into account contextual factors

#### 2. Literature Review – maximum 5 Points

4-5 points - The literature selected for the study topic is fully compatible with the job requirements;

3-4 Scores - The literature selected around the study topic is partially compatible with the job requirements;

2-3 points - The literature selected on the topic of study is not analyzed at the appropriate level;

1-2 points - The selected literature around the subject of the study is random;

0-1 Scores - The selected literature does not match the job requirements.

#### 3. Research Methodology - Maximum 5 Points

4-5 points - Research Methods are effective, is selected purposefully and complexly

3-4 points - The separate methods of research are purposefully selected;

2-3 points The research methods used do not provide the concrete results;

1-2 points The research methods are selected unqualified;

0-1 score Research methods do not conform to specific results.

#### 4. Expected Results of Research - Maximum 5 Points

4-5 points The expected results of the research are logically explained and argument;

3-4 points The expected results of the research are logically explained, but lack of clarity argumentation;

2-3 points The expected results of the research are explained, but are not substantiated

1-2 points The expected results of the research are superficial and aren't argument;

0-1 score The expected results of the study are unqualified without any justification.

Maximum score are 100 points. The scaled score (S) of the assessment is obtained by the formula  $S = 5 \times M$  where M is the total score for all four components evaluation. (Resolution No 2645 of the Academic Board, 10 November 2017).

In case of positive assessment of the prospectus (51 and more points), the graduate student continues to study. In case of a negative assessment of the prospectus (less than 51 points), the master will repeat the work according to the existing rule

#### Colloquium evaluation

The results of the survey for colloquial assessment shall be submitted to the Faculty Dean, which creates commission with 3-5 members until the completion of the corresponding training semester (no later than 15th week). Representatives of the respective field academic personnel should be included in the Commission. The mentor of student has to be present on the work of the Commission. At the Commission, the Master submits the research work Results (10-15 Minutes) at the given stage. Each member of the Commission estimates on the basis of 5 components:

- The methodology and direction of the research is Corresponds with problem at the given stage;
- The quality of the research conducted at the given stage
- Make a conclusion based on the research conducted at the given stage
- Determining the further direction of the research;
- Ability to present topic

#### Colloquium assessment criteria

1. Comparison of the methods and direction of research conducted at the given stage with the problem - maximum 5 points

4-5 points - The methods and direction of the research conducted at the given stage are fully compatible with the theme requirements;

3-4 Points - Methods and direction of the research carried out at this stage is partially satisfying the theme requirements;

2-3 points - The survey conducted at this stage is not adequately reviewed and analyzed;

1-2 points - The survey conducted at this stage is accidental and lacks compliance with the theme requirements;

0-1 score - The survey conducted at this stage does not meet the requirements of the theme at all

2. The quality of research conducted at this stage - maximum 5 points

4-5 point - The quality of research conducted at the stage is high;

3-4 points - The quality of research conducted at this stage is acceptable;

2-3 points - The quality of research conducted at this stage is satisfactory but not perfect;

1-2 points The research carried out at this stage contains defects;

0-1 Score The quality of the research carried out at this stage is low

3. Make a conclusion based on the research conducted at the given stage - maximum 5 points

4-5 points Conclusions are clearly formed based on the research conducted at the given stage;

3-4 points The findings based on the research conducted at this stage are acceptable;

2-3 points conclusions Based on the research carried out at the given stage include minor defects;

1-2 points conclusions Based on the research conducted at the given stage, they are presented by faults;

0-1 score conclusions Based on the research conducted at this stage, are inadequate.

4. Determine the further direction of the research - maximum 5 points

4-5 points The follow-up direction of the study is clearly defined, complying with the theme requirements;

3-4 points The follow-up direction of the survey is defined incompletely, although the requirements of the theme are compatible;

2-3 points The follow-up direction is defined by faults but in line with the theme requirements;

1-2 points The follow-up direction is determined vaguely, and slightly compatible with the theme requirements;

0-1 points The follow-up further directions do not match the requirements of the theme

5. Ability to present topic - maximum 5 points

4-5 points - discussion are reasonable and convincing. Information about the topic is exhausted, demonstrated the knowledge of the issue thoroughly;

3-4 points - discussion is good. Professional terminology is used. The student reflects the contents of the presented topic, but lacks the conviction;

2-3 points - discussion is incomplete. Professional terminology is not used;

1-2 points - Discussion is short and fragmentary, does not reflect the contents of the presented topic;

0-1 point The student failed to protect the topic. Discussion is not relevant to the issue.

The scaled score (S) of the assessment is obtained by the formula  $S = 5 \times M$  where M is the total score for all five components evaluation. (Resolution No 2645 of the Academic Board, 10 November 2017).

In case of positive assessment of the prospectus (51 and more points), the graduate student continues to study. In case of a negative assessment of the prospectus (less than 51 points), the master will repeat the work according to the existing rule

Evaluation of the qualification work

The public examination of the qualification work is evaluated by the examination commission comprising 5-7 members with a 100-point assessment system, in the following criteria:

- description of the researched problem, its actuality and practical significance;
- analysis of existing literature around the topic of study;
- Used research methods;
- Discussion The results of the survey;
- Make a conclusion based on research;
- Quality of the documentary material and the ability to present

Evaluation criteria of qualification work

1. description of the researched problem, its actuality and practical significance - maximum 4 points

3-4 points The research problem, and its actuality is clearly defined and evaluated;

2-3 points The research problem is topicality formulated but not analyzed;

1-2 points The research problem is topicality formulated, but are not formed

0-1 Points The research problem isn't topicality formulated or not presented at all.

2. Analysis of literature on research topic - maximum 4 points

3-4 points Literature is correctly selected and its analysis is fully compatible with research objectives;

2-3 points The literature is quite correctly selected and its analysis is partially in line with the research objectives;

1-2 - points Literature is not fully selected and its analysis is not conducted at appropriate level;

0-1- point Literature is random, does not match the research goals.

### 3. Used Research Methods - Maximum 4 Points

3-4 - points Research methods are used efficiently, purposefully and complexly;

2-3 - points The individual methods of research are used effectively and purposefully;

1-2 -Points The research methods used do not provide adequate level of concrete results;

0-1- point Research methods are not used or used unqualified

### 4. Discussion The results of the survey - maximum 4 points

3-4 points - discussion of results of the survey are qualified;

2-3 points- discussion of results of the survey is presented more qualified;

1-2 points - discussion of results of the survey are needed to improve;

0-1 point - discussion of results of survey is nonqualified

### 5. Making a conclusion based on research - maximum 4 points

3-4 points - The conclusion based on the research are clearly formed;

2-3 points The conclusion based on the research are acceptable, although minor shortcomings include;

1-2 points The conclusions based on the research are presented by faults;

0-1 Score The conclusion based on the research are inadequate.

### 6. Ability to present the paper and the degree of decoration - maximum 5 points

4-5 points - presentation is reasonable and convincing. Information about the topic is exhausted, demonstrated by the knowledge of the issue thoroughly;

3-4 points - presentation is good. Professional terminology is used. The student shows the knowledge of the contents of the presented topic, but lacks in conviction;

2-3 points are incomplete and unbelievable. Professional terminology is not used;

1-2 points Discussion is short and fragmentary, does not reflect the contents of the presented topic;

0-1 score The student failed to protect the topic. Discussion is not relevant to the issue.

The scaled score (S) of the assessment is obtained by the formula  $S = 5 \times M$  where M is the total score for all six components evaluation. (Resolution No 2645 of the Academic Board, 10 November 2017).

public protection of the undergraduate is defined by each member of the commission by the arithmetic average of the received points. the qualification work is not considered if the most of examination committee members assess person less than 51 points. if during the vote voices are divided equally the voice of the chairman of the commission is decisive. on the basis of the decision of Commission's is created commission minutes

## **Sphere of Employment**

The knowledge acquired by graduates of the program can successfully work in water supply and wastewater systems companies, industrial and commercial enterprises, civil organizations, government agencies, consulting firms and agencies, energy companies, in corresponding, Ministries and their affiliated agencies; Supervision and Architecture Service of municipality; construction agencies, municipal utility services, water supply agencies, regional, municipal and national sewerage organizations and other organizations and educational organizations.

## **Potential for Further Education**

Doctoral Educational Programs



## Human and Material Resources Required to Implement the Program

The program provides the appropriate human and material resources. For more information see the attached documents

The Number of Syllabi Attached: 15

### Courses in the Program

Nº	Course	Admission prerequisites	ECTS Credits			
			I Year		II Year	
			Semester			
			I	II	III	IV
<b>Educational Component:</b>						
1	Hydrology of Surface and Groundwater	N/A	7			
2	Water Resources Assessment	N/A	5			
3	Water Quality Assessment	N/A	5			
4	Water Resources Engineering	N/A	8			
Elective courses						
5	Environmental Chemistry	N/A	5			
6	Design, Construction and Exploitation of Industrial and Agrarian Water Supply, Wastewater and Irrigation Systems	N/A	5			
7	Water Resources Monitoring	Water Resources Assessment; Water Quality Assessment		7		
8	Environment Defense and Sustainable Development	N/A		5		
9	Water Resources Planning	N/A		8		
Elective courses						
10	Management of Design of Water Supply and Wastewater Systems	N/A		5		
11	Environmental Engineering	N/A		5		
12	Water Systems Modeling	Water Quality Assessment; Water Resources Assessment.			8	
13	Integrated Water Resources Management	N/A			7	
Elective courses						
14	Watershed Management	N/A			5	
15	Modern Technologies of Wastewater Treatment	N/A			5	
<b>Per semester</b>			<b>30</b>	<b>25</b>	<b>20</b>	
<b>Total:</b>			<b>75</b>			

Research Component:						
1	Master Research Project / Prospectus	N/A		5		
2	Theoretical / experimental research / colloquium	Master Research Project / Prospectus			10	
3	Accomplishment and Defense of Master's Thesis	Theoretical / experimental research / colloquium				30
Total per semester:			30	30	30	30
Total per year:			60		60	
Total:			120			

### Learning Outcomes Map

Nº	Subject	Knowledge and understanding	Applying knowledge	Making judgments	Communication skills	Learning skills	Values
1	Hydrology of Surface and Groundwater	X	X	X	X		
2	Water Resources Assessment	X	X			X	
3	Water Quality Assessment	X	X		X	X	
4	Water Resources Engineering	X	X		X		X
5	Water Resources Monitoring	X	X	X	X		
6	Environment Defense and Sustainable Development	X		X	X	X	
7	Water Resources Planning	X	X	X			X
8	Water Systems Modeling	X	X	X			X
9	Integrated Water Resources Management	X	X	X	X		X
<b>Elective courses</b>							
10	Environmental Chemistry	X	X		X		
11	Design, Construction and Exploitation of Industrial and Agrarian Water Supply, Wastewater and Irrigation Systems	X	X	X		X	X
12	Management of Design of Water Supply and Wastewater Systems	X	X	X		X	
13	Environmental Engineering	X	X		X		X
14	Watershed Management	X	X	X		X	
15	Modern Technologies of Wastewater Treatment	X	X		X	X	
<b>Research Component:</b>							
	Master Research Project / Prospectus	X	X	X	X	X	X
	Theoretical / experimental research / colloquium	X	X	X	X	X	X
	Accomplishment and Defense of Master's Thesis	X	X	X	X	X	X

## Program curriculum

№	Course code	Subject	ESTS credits / hours	Hours									
				Lecture	Seminar (work in the group)	Practical classes:	Laboratory	Practice	Course paper / project	Mid-semester exam	Final exam	Independent work	
1	AAC92501E1	Hydrology of Surface and Groundwater	175	30		30					1	2	112
2	AAC92601E1	Water Resources Assessment	125	30	15						1	2	77
3	AAC92701E1	Water Quality Assessment	125	15	30						1	2	77
4	AAC92801E1	Water Resources Engineering	200	30		22,5		15			1	2	129,5
5	AAC92901E1	Water Resources Monitoring	175	30	30						1	2	112
6	AAC93001E1	Environment Defense and Sustainable Development	125	15	30						1	2	77
7	AAC92901E1	Water Resources Planning	200	30			22,5	15			1	2	129,5
8	AAC93101E1	Water Systems Modeling	200	30			22,5	15			1	2	129,5
9	BUA76701E1	Integrated Water Resources Management	175	15		15			30		2	2	111
<b>Elective courses</b>													
10	ENV12201E1	Environmental Chemistry	125	15		30					1	2	77
11	BUA76501E1	Management of Design of Water Supply and Wastewater Systems	125	15		30					1	2	77
12	AAC93101E1	Design, Construction and Exploitation of Industrial and Agrarian Water Supply, Wastewater and Irrigation Systems	125	15		30					1	2	77
13	EET27001E1	Environmental Engineering	125	15	30						1	2	77
14	BUA76601E1	Watershed Management	125	15		30					1	2	77
15	AAC92201E1	Modern Technologies of Wastewater Treatment	125	15		30					1	2	77

Program Supervisor

Irma Inashvili

Faculty of Civil Engineering

Head of Quality Assurance Service of  
The Faculty of Civil Engineering

Marina Javakhishvili

Dean of the Faculty

David Gurenidze

**Approved**

Faculty of Civil Engineering  
At the Session of the Faculty Council

19.05.2014 №7

**Agreed with**

Quality Assurance Service of GTU

Irma inashvili

**Modified**

Faculty of Civil Engineering  
At the Session of the Faculty Council

30.03.2018 № 25

Chairman of the Faculty Council

David Gurgenidze