Ivane Javakhishvili Tbilisi State University
Faculty Exact and Natural Sciences
Department of Computer Sciences

Bachelor Program

Computer Science
კომპიუტერული მეცნიერება

Academic degree:
Bachelor of Computer Science

კომპიუტერული მეცნიერების ბაკალავრი

Tbilisi
2025

Faculty	Faculty Exact and Natural Sciences
Program name	Computer Science
Program volume in credits	240 ECTS
Language of teaching	English
Academic degree awarded	Bachelor of Computer Science
Prerequisite to access to the program	The Georgian citizens must pass Unified National Exams. Admission for the program requires minimal competence levels in following Unified National Exams: • English Language - 69% + 1 • Mandatory subjects– minimum competence levels is determined by National Assessment and Examinations Center Mathematics/Physics - minimum competence levels is determined by TSU faculty Exact and Natural Sciences Foreign applicants should follow the rules and terms defined by the Ministry of Education and Science of Georgia (http://www.mes.gov.ge/content.php?id=1131&lang=geo) according to the order №224/N of the Minister of Education and Science of Georgia (December 29, 2011). The Applicant should prove English language qualification equivalent to CEFR level B2 (or higher) or have a high school education in English. .
Program Heads	Manana Khachidze
Program Coordinator	Magda Tsintsadze
Tution fee	for the citizens of Georgia - 2250 GEL For foreign nationals - $ 4000 or equal in GEL per academic year

Program Educational Objectives

The educational objectives of the undergraduate program "Computer Science" are to issue graduates who will

1. be productive, responsible computing science professionals conducting research and/or design developing and maintaining projects in the various areas of Computer Science,
2. understand and apply ethical issues and social aspects of computing science in performing their duties as computer science professionals,
3. continue the learning of new technologies in the computer science area through self-directed professional development or post-graduate education.

Student Outcomes

Department of Computer Sciences adopted ABET CAC Student outcomes:

1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
2. Design, implement and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
3. Communicate effectively in a variety of professional contexts.
4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
6. Apply computer science theory and software development fundamentals to produce computing-based solutions.

ABET CAC Student outcomes		**Knowledge and understanding**	**Skills**	**Autonomy and Responsibility**
1.	**Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.**			
2.	**Design, implement and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.**			
3.	**Communicate effectively in a variety of professional contexts.**			
4.	**Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.**			
5.	**Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.**			
6.	**Apply computer science theory and software development fundamentals to produce computing-based solutions**			

Performance Indicators for Student Outcomes

Student Outcomes:

1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
   PI 1: Analyze a complex computing problem to identify a solution

PI 2: Apply principles of computing to identify a solution to a complex computing problem
PI 3: Apply principles of relevant disciplines to identify a solution to a complex computing problem

2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
   PII1: Design a software solution to meet a given set of computing requirements
   PII2: Implement a software solution to meet a given set of computing requirements
   PII3: Evaluate a computing-based solution to meet a given set of computing requirements

3. Communicate effectively in a variety of professional contexts
   PIII1: Participate effectively in group discussions
   PIII2: Prepare an effective presentation
   PIII3: Write an effective project report

4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
   PIV1: Recognize professional responsibilities in computing practice based on legal and ethical principles.
   PIV2: Make informed judgment in computing practice based on legal and ethical principles

5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
   PV1: Effectively engaged in team as member or leader
   PV2: Contributes effectively for common task

6. Apply computer science theory and software development fundamentals to produce computing-based solutions.
   PVI1: Apply computer Science theory to produce a solution
   PVI2: Apply software development fundamentals to produce a solution

Level Of Learning Achievement

The learning outcomes are defined in the disciplines envisaged by the Bachelor Program of "Computer Science", which are taught in I-VIII semester. To reach this level means:

- Knowledge of fundamental principles and theories in computer science;
- Ability to use key and fundamental algorithms of computer science in different fields of science and practice;
- Ability to use modern programming languages and tools;
- Ability to operate and use different purpose tools of computer science and information technology.

Fields of Employment

Fields of employment of Bachelor of Computer Science are: Governance bodies, educational institutions and organizations of different forms of ownership which use computer technologies for their activities. Bachelor of computer science is predominantly prepared for the development and use of modern methods in the field of economy, management and financial activities. Bachelor of Computer Science can occupy any position that according to the laws of Georgia require higher education. The presented bachelor program takes care of graduates' employment, by means of providing opportunities for continues education, as well as by means of invited lectures participating in the program: most of them are representatives of big employers at Georgian labor market, their tight relationship with students increases the chance of employment of successful students with favorable conditions.

The Possibility to Continue Learning

Bachelor of Computer Science will be able to continue their study at master degree programs in Computing area, which represent the extension of the undergraduate program. The graduates can continue their education also at master programs in mathematics, engineering, and other Natural Sciences those prerequisite are programming and mathematical knowledge. Major specialty-choosing deadline

The third semester is the deadline for choosing major specialty (optimal is the second semester). If students change their mind, they will be able to continue learning at other bachelor programs being carried out at the faculty (mathematics, electronics).

Program Delivery Modes

The Computer Science program is offered as an on-campus daytime program. Our academic year is divided into two semesters (fall and spring). Each semester 15 weeks of instruction, with the sixteenth week used for final examinations.

The required courses in computer science are offered in every semester, and the most of elective ones are offered at least once a year. Most undergraduate courses are offered during daytime.

There are three basic program delivery modes:

Lectures: verbal, problem-based learning (PBL), demonstration method, induction, deduction, analysis and synthesis.

Seminars, practical and laboratory teaching: verbal, book-based method, laboratory and demonstration methods, practical methods, induction methods, analysis method, and synthesis method, electronic attending (E-learning).

Team Projects: Verbal, PBL, E-learning, cooperative learning, collaborative work.

Grading scheme and grade distribution guidance

The student's knowledge is being evaluated according to the following system: "Excellent", "Very good", "Good", "Satisfactory", "Sufficient", "Marginal fail" and "Fail"
A student is evaluated in accordance with the following principle:

Scores	Evaluation	Classification of Evaluation	GPA of Evaluation
91 and more	(A) “Excellent”	Positive	4.0
81 -90	(B) “Very good”	Positive	3.0
71 -80	(C) “Good”	Positive	2.0
61 -70	(D) “Satisfactory”	Positive	1.0
51 -60	(E) “Sufficient”	Positive	0.5
41 -50	(FX) “Marginal Fail”	Negative	0
40 and below	(F) “Fail”	Negative	0

The student’s final mark in a specific subject is determined by the number of point collected by him/her in the different components (lecture, seminar, practical studies, laboratory exercises) in the course of interim and final (examination) evaluation.

The maximum a viable point in each course is 100. Final exam does not exceed 40 points, interim evaluation represents a combination of test scores, presentation in the class, and team or individual projects. The weight of each components are different for different course and are defined in syllabuses

Grading System of the CS Program is consistent with the TSU standard grading system:

Evaluation	Scores	GPA
A	91-100	4.0
B	81-90	3.0
C	71-80	2.0
D	61-70	1.0
E	51-60	0.5
F-FX	0-50	0.0

Curriculum

Full volume of 240 ECTS. from here:

130 ECTS - Computer Science subjects;

30 ECTS - Mathematical subjects;

20 ECTS - Natural Sciences subjects;

30 ECTS - General education

30 ECTS – Free.

	Course	Subject status	ECTS	hours	Lecture / Practice / Work / Lab	Prerequisite	Fall	Spring
CS101	ICT Literacy	**R**	5	30/95	0/0/0/2	N/R		
CS102	Basics of Programming	**R**	5	60/65	2/0/0/2	N/R		
MaTh101	Calculus	**R**	5	60/65	2/2/0/0	N/R		
MaTh102	Linear Algebra	**R**	5	60/65	2/2/0/0	N/R		
GE	General Education Subject							
SC105	Introduction to Physics	**R**	5	60/65	2/2/0/0	N/R		
							30	30
CS104	Object Oriented Programming 1 (C ++)	**R**	5	60/65	2/2/0/0	CS102		
MaTh201	Discrete Mathematics	**R**	5	60/65	2/2/0/0	MaTh102, CS102		
MaTh202	Calculus for Computer Science	**R**	5	60/65	2/2/0/0	MaTh101		
PH105	Physics (Mechanics)	**R**	5	75/50	2/1/0/2	SC105		
GE	General Education Subject							
Elect.	CS/Math/GE/Sc	**E**	5					
							30	30
CS200 (212) (222) (242)	 Object Oriented Programming 2 (C#) or Object Oriented Programming 2 (Java) or Object Oriented Programming 2 (Python)	**R**	5	45/80	 1/2/0/0 2/0/0/1 1/0/0/2	 CS104 CS104 CS102		
CS203	Computer Architecture and Organization	**R**	5	45/80	1/0/1/1	CS102		
CS204	Data Structures	**R**	5	60/65	2/0/0/2	CS104		
Elect.	CS/Math/GE/Sc	**E**	5					
Elect.	CS/Math/GE/Sc	**E**	5					
Elect.	CS/Math/GE/Sc	**E**	5					
							30	30
CS304	Data Base	**R**	5	60/65	1/0/1/2	CS104		
Math305	Data Analysis and Statistics	**R**	5	60/65	1/0/2/1	MaTh202		
CS302	Operating systems	**R**	5	45/80	1/0/1/1	CS104		
Elect.	CS/Math/GE/Sc	**E**	5					
Elect.	CS/Math/GE/Sc	**E**	5					
Elect.	CS/Math/GE/Sc	**E**	5					

							30	30
CS303	Modeling and Simulation	**R**	5	60/65	1/0/2/1	Math305		
CS410	Algorithms	**R**	5	60/65	2/1/0/1	CS204 MaTh201		
CS401	Software Engineering	**R**	5	30/95	1/0/1/0	CS204		
Elect.	CS/Math/GE/Sc	**E**	5					
Elect.	CS/Math/GE/Sc	**E**	5					
Elect.	CS/Math/GE/Sc	**E**	5					
							30	30
Math416	Mathematical Programing	**R**	5	45/80	1/2/0/0	MaTh202		
CS305	Network Technologies and Communications	**R**	5	45/80	1/0/0/2	CS203		
CS301	Web Programming	**R**	5	60/65	2/0/0/2	CS104		
CS505	Functional Programing	**R**	5	45/80	1/1/0/1	CS104		
Elect.	CS/Math/GE/Sc	**E**	5					
Elect.	CS/Math/GE/Sc	**E**	5					
							30	30
CS417	Operations Research	**R**	5	45/80	1/1/0/1	Math416		
CS402	Project Preparation	**R**	5	30/95	1/0/1/0	CS401, 165 ECTS		
CS512	Formal Language and Automata	**R**	5	45/80	1/2/0/0	CS204		
Elect.	CS/Math/GE/Sc	**E**	5					
Elect.	CS/Math/GE/Sc	**E**	5					
Elect.	CS/Math/GE/Sc	**E**	5					
							30	30
CS403	Artificial Intelligence	**R**	5	45/80	1/0/1/1	CS204		
CS404	Computer law and Ethics	**R**	5	30/95	1/0/1/0	no earlier than the 6th semester		
CS405	Team Projects	**R**	5	30/95	0/0/2/0	CS402		
Elect.	CS/Math/GE/Sc	**E**	5					
Elect.	CS/Math/GE/Sc	**E**	5					
Elect.	CS/Math/GE/Sc	**E**	5					
							30	30
						Sum	**240 ECTS**	
Computer Scisnce Electives								
CS001	Computer Mathematical System Matlab	**SR**	5	45/80	1/0/0/2	CS101, MaTh101		F/S
CS011	Computing Technology	**SR**	5	45/80	1/0/1/1	N/R		F/S
CS411	Algorithms Analyze and Complexity	**SR**	5	45/80	2/1/0/0	CS410		F/S
CS501	Algorithmic Information Theory	**SR**	5	30/95	1/1/0/0	CS410		F/S
CS502	Algorithms for Computational Topology	**SR**	5	30/95	1/1/0/0	CS410		F/S
CS503	Introduction to Complexity Theory	**SR**	5	30/95	1/1/0/0	CS410		F/S
CS506	ADO.NET technology - data access from NET application	**SR**	5	30/95	1/1/0/0	CS200(212)		F/S
CS510	Programming with Java (Advanced Course)	**SR**	5	45/80	2/0/0/1	CS200(222)		F/S

CS511	Information Management	**SR**	5	45/80	2/0/1/0	CS101	F/S
CS513	Genetic Algorithms	**SR**	5	45/80	1/1/0/1	CS204	F/S
CS514	Neural Networks	**SR**	5	45/80	1/1/0/1	CS204	F/S
CS520	Network Technologies and Communications 2	**SR**	5	45/80	1/1/0/1	CS305	F/S
CS526	Introduction to Linux systems	**SR**	5	45/80	1/2/0/0	CS102	F/S
CS527	Linux System Administration	**SR**	5	45/80	1/2/0/0	CS302	F/S
CS530	Software testing	**SR**	5	30/95	1/0/0/1	CS200 (212 or 222 or 242)	F/S
CS531	The basics of Computer Game Development	**SR**	5	45/80	1/0/0/2	CS104, SC105	F/S
CS533	Mobile Based Programming	**SR**	5	45/80	1/0/0/2	CS200(222)	F/S
CS536	Introduction to Scientific Modeling	**SR**	5	45/80	1/0/0/2	CS204, Math101	F/S
CS537	Machine Learning	**SR**	5	45/80	1/1/0/1	CS204	F/S
CS541	IT Project Management	**SR**	5	45/80	1/0/0/2	CS101	F/S
CS542	Introduction Bioinformatics	**SR**	5	45/80	1/0/2/0	CS204	F/S
CS545	Compilers	**SR**	5	45/80	1/2/0/0	CS302	F/S
CS549	Web Development on Java (using Spring Boot)	**SR**	5	45/80	1/0/0/2	CS200(222)	F/S
CS551	Bitcoin, blockchain technology and decentralized applications	**SR**	5	30/95	1/0/0/1	CS104	F/S
CS552	Unreal reality engines in computer games	**SR**	5	45/80	1/0/0/2	CS102, CS310	F/S
CS555	Internship	**SR**	5				F/S
CS556	Internship 2	**SR**	5			CS555	F/S
CS557	Universal Text Editor	**SR**	5	45/80	1/0/0/2	CS104	F/S
CS560	Modern Concurrency Programming	**SR**	5	30/95	1/0/0/1	CS104	F/S
CS561	Modern technologies of data analysis	**SR**	5	30/95	1/0/1/0	CS304	F/S
CS562	Advanced C Programming	**SR**	5	45/80	1/1/0/1	CS102	F/S
CS567	Natural Language Processing	**SR**	5	45/80	1/0/2/0	CS200(242)	F/S
CS568	IT Business Analytics	**SR**	5	30/95	1/1/0/0	MaTh305	F/S
CS569	Data Storage and Processing Technologies	**SR**	5	45/80	1/0/0/2	CS200(242)	F/S
CS571	System Programming	**SR**	5	45/80	1/0/0/2	CS104	F/S
CS601	Advance topic of Computer Sciences	**SR**	5	45/80	1/0/2/0	CS104	F/S
CS602	Graphical Programming	**SR**	5	45/80	1/0/0/2	CS102	F/S
CS603	Cloud Technology	**SR**	5	30/95	1/0/0/1	CS305	F/S
CS604	Advance Topics in Computer Science (Logic Programming)	**SR**	5	45/80	1/0/2/0	CS104	F/S
CS607	Fundamentals of Cyber Security	**SR**	5	45/80	2/1/0/0	CS104	F/S
CS608	Ethical Hacking	**SR**	5	45/80	2/1/0/0	CS102	F/S
CS651	Introduction to Blockchain Thechnology	**SR**	5	45/80	2/0/1/0	CS102	F/S
Mathematical subjects electives							
MaTh301	Applied Probability	**SR**	5	45/80	1/0/2/0	MaTh101	F/S
Math503	Numerical Analysis	**SR**	5	45/80	1/1/0/1	MaTh101, MaTh102, CS102	F/S
MaTh504	Technologies of Mathematical Modeling	**SR**	5	45/80	1/0/0/2	MaTh101	F/S
MaTh505	Applied Statistics	**SR**	5	45/80	1/2/0/0	MaTh101, MaTh102	F/S

MaTh506	Probability Models for Computer Science	**SR**	5	45/80	1/2/0/0	MaTh201 or MaTh301	F/S
General Education							
GE101	Georgian Language for Foreigners 1	**SR**	5	60/65	0/0/4/0	N/R	F/S
GE102	Georgian Language for Foreigners 2	**SR**	5	60/65	0/0/4/0	GE101	F/S
GE103	Georgian Language for Foreigners 3	**SR**	5	60/65	0/0/4/0	GE102	F/S
GE521	A live Language 1 (French)	**SR**	5	60/65	0/0/4/0	N/R	F/S
GE522	A live Language 2 (French)	**SR**	5	60/65	0/0/4/0	GE521	F/S
GE523	Intercultural Education	**SR**	5	45/80	1/0/2/0	N/R	F/S
GE16	Introduction to Applied Linguistics	**SR**	5	45/80	1/0/2/0	N/R	F/S
GE17	Communication Studies	**SR**	5	45/80	1/0/2/0	N/R	F/S
GE18	Modern Literature. Modes and Trends	**SR**	5	45/80	1/0/2/0	N/R	F/S
GE	Japanese language 1	**SR**	5	45/80	2/2/0/0	N/R	F/S
GE	Japanese language 2	**SR**	5	45/80	2/2/0/0	Japanese language 1	F/S
GE511	Creative Writing	**SR**	5	45/80	1/0/2/0	N/R	F/S
GE	Foreign Language 1 (German)	**SR**	5	60/65	0/4/0/0	N/R	S
GE	Foreign Language 2 (German)	**SR**	5	60/65	0/4/0/0	Foreign Language 1 (German)	F
GE	Foreign Language 1 (French)	**SR**	5	60/65	0/4/0/0	N/R	S
GE	Foreign Language 2 (French)	**SR**	5	60/65	0/4/0/0	Foreign Language 1 (French)	F
GE	Foreign Language 1 (Russian)	**SR**	5	60/65	0/4/0/0	N/R	S
GE	Foreign Language 2 (Russian)	**SR**	5	60/65	0/4/0/0	Foreign Language 1 (Russian)	F
Natural Sciences subjects							
Che101	Introduction to Chemistry	**SR**	5	60/65	2/2/0/0	N/R	F/S
Geo201	Earth's Spheres and Their Interactions	**SR**	5	45/80	2/1/0/0	N/R	F/S
Che102	Polymer Chemistry	**SR**	5	45/80	1/2/0/0	Che101	F/S
PH106	Physics (Electromagnetism)	**SR**	5	75/50	2/1/0/2	PH105	F/S

Additional Information on the Program Components and Credit Distribution

130 ECTS – Computer Science Subjects:

- **100 ECTS** are defined directly as core disciplinary subjects (course code: the first two symbols "CS" followed by three digits, with "Req." indicated in the course status column). Among them, *Object-Oriented Programming 2 (Java, C#, Python)* represents a compulsory elective block. The student is required to study at least one of the listed courses.
- **30 ECTS** are elective disciplinary subjects (course code: the first two symbols "CS" followed by three digits, with "Elect." indicated in the course status column).

30 ECTS – Mathematics Subjects:
The compulsory subjects in the Mathematics block are: *Calculus, Calculus for Computer Science, Linear Algebra, Discrete Mathematics, Data Analysis and Statistics, Mathematical Programming.*

20 ECTS – Natural Sciences Subjects:
The student is required to complete **10 ECTS** in the compulsory subject *Introduction to Physics, Physics (Mechanics).*
Additionally, the student must complete **10 ECTS** in another Natural Science subject chosen from the faculty's natural science offerings.

30 ECTS – General Education:

To fulfill the General Education block, a foreign student is required, in addition to 15 ECTS credits in the Georgian language (Georgian Language 1, 2, 3), to complete at least 15 ECTS credits in any subject outside the fields of Computer Science and Natural Sciences (e.g., Humanities, Sociology-Political Science, Economics and Business, Engineering). A minor program in another specialization completed by the student may also be counted as a General Education block.

30 ECTS – Free Electives:
Any subject from any active bachelor's program at TSU (Tbilisi State University).

CS Program Course Mapping to Program SLOs.

CS COURSES	STUDENT OUTCOME / PERFORMACE INDICATORS														
	PI 1			PI 2			PI 3			PI 4		PI 5		PI 6	
	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P5.1	P5.2	P6.1	P6.2
CS102 Basics of Programming	L	L		L	L									L	
CS104 Object Oriented Programming 1 (C ++)	M	M		M	M									M	L
CS203 Computer Architecture and Organization	M			L	L	L	M		M						
CS200 (212, 222, 242) OOP 2 (Java, C#, Python)	M	M		M	M	M								M	M
CS204 Data Structures	M			M	M		M								
CS301 Web Programming		H		H	H	M								H	H
CS302 Operating systems	M		M	M		M		M				H			
CS303 Modeling and Simulation	M	M		M	M	M	M	M				M			M
CS304 Data Base	M			M	M				M			L			
CS305 Network Technologies and Communications	H	M		M	H	M			H					H	H
CS401 Software Engineering	H			H	H	H								H	H
CS402 Project Preparation	H	H	H				H	H	H						
CS403 Artificial Intelligent	H	H	H											M	
CS404 Computer law and Ethics				M						H	H				
CS405 Team Project		H	H	H	H	H	H	H	H		H	H	H	H	H
CS410 Algorithms	H	M		H			H	H				M			M
CS417 Operations Research	H			H	H									H	
CS505 Functional Programing	H		H	H	H				H						
CS517 Formal Language and Automata	H					H								H	

H- High
M - Middle
L – Low