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
2021

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 - $ 3,500 or GEL 9,000 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 number of contact hours (lecture/practice/workshop/lab) correspond to 5 ECTS and usually meet for three 50-minute periods each week.

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 points sand more	(A) “Excellent”	Positive	4.0
81 -90 points	(B) “Very good”	Positive	3.0
71 -80 points	(C) “Good”	Positive	2.0
61 -70 points	(D) “Satisfactory”	Positive	1.0
51 -60 points	(E) “Sufficient”	Positive	0.5
41 -50 points	(FX) “Marginal Fail”	Negative	0
40 points 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 points	4.0
B	81-90 points	3.0
C	71-80 points	2.0
D	61-70 points	1.0
E	51-60 points	0.5
F-FX	0-50 points	0.0

Curriculum

Full volume of 240 ECTS. from here:

140 ECTS - Computer Science subjects;
30 ECTS - Mathematical subjects;
20 ECTS - Natural Sciences subjects;
30 ECTS - General education
20 ECTS – Free .

	Course	Subject status	ECTS	hours	Lecture / Practice / Work / Lab	Prerequisite	Fall	Spring
CS101	ICT Literacy	**R**	5	30/95	1/0/0/2	N/R		
CS102	Basics of Programming	**R**	5	45/80	1/1/0/1	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 Course	**R**	5	60/65	0/4/0/0	N/R		
SC 101	Introduction to Physic	**R**	5	60/65	2/2/0/0	N/R		
							30	**30**
CS104	Object Oriented Programming 1 (C ++)	**R**	5	60/65	1/2/0/1	CS101		
MaTh201	Discrete Mathematics	**R**	5	60/65	2/2/0/0	MaTh102		
CS105	Data Structures	**R**	5	60/65	1/0/1/1	CS102		
MaTh202	Calculus for Computer Science	**R**	5	45/80	2/1/0/0	MaTh101		
GE	General Education Course	**R**	5	60/65	0/4/0/0	N/R		
PH 105	Physic (Mechanics)	**R**	5		2/1/0/2	SC 105		
							30	**30**
CS202	Object Oriented Programming 2 (C#, Java, Python)	**R**	5			CS104		
CS304	Web Programming	**R**	5	45/80	1/0/1/1	CS104		
CS302	Operating systems	**R**	5	45/80	1/0/1/1	CS104		
PH 106	Physic (Electromagnetism)	**R**	5		2/1/0/2	PH 105		
Elect.	CS/Math/GE/Sc	**E**	5					
Elect.	CS/Math/GE/Sc	**E**	5					
							30	**30**
CS204	Data Base	**R**	5	60/65	1/0/1/2	CS104		
CS205	Data Analysis and Statistics	**R**	5	60/65	1/0/2/1	MaTh201		
CS203	Computer Architecture and Organization	**R**	5	45/80	1/0/1/1	CS104, MaTh201		
Elect.	CS/Math/GE/Sc	**E**	5					

Elect.	CS/Math/GE/Sc	**E**	5					
Elect.	CS/Math/GE/Sc	**E**	5					
							30	**30**
CS 512 CS 505	Formal Language and Automata or Functional Programing	**R**	5	30/95 45/80	1/2/0/0 1/1/0/1	CS310 CS104		
CS303	Modeling and Simulation	**R**	5	60/65	1/0/2/1	CS205		
CS310	Algorithms	**R**	5	60/65	2/2/0/0	MaTh201, CS105		
Elect.	CS/Math/GE/Sc	**E**	5					
Elect.	CS/Math/GE/Sc	**E**	5					
Elect.	CS/Math/GE/Sc	**E**	5					
							30	**30**
CS416	Mathematical Programing	**R**	5	45/80	2/1/0/0	MaTh202		
CS305	Network Technologies and Communications	**R**	5	45/80	1/0/0/2	CS302		
CS 512 CS 505	Formal Language and Automata or Functional Programing	**R**	5	30/95 45/80	1/2/0/0 1/1/0/1	CS310 CS104		
CS411	Algorithms Analyze and Complexity	**R**	5	45/80	2/2/0/0	CS310		
Elect.	CS/Math/GE/Sc	**E**	5					
Elect.	CS/Math/GE/Sc	**E**	5					
							30	**30**
CS401	Software Engineering	**R**	5	30/95	1/0/1/0	CS310 CS202		
CS417	Operations Research	**R**	5	45/80	1/0/2/1	CS416		
CS402	Project Preparation	**R**	5	30/95	1/0/1/0	165 ECTS		
Elect.	CS/Math/GE/Sc	**E**	5					
Elect.	CS/Math/GE/Sc	**E**	5					
Elect.	CS/Math/GE/Sc	**E**	5					
							30	**30**
CS403	Intelligent Systems	**R**	5	45/80	1/0/1/1	CS106, CS104		
CS404	Computer law and Ethics	**R**	5	30/95	1/0/1/0			
CS405	Team Projects	**R**	5	30/95	0/0/2/0	CS401, 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							
CS501	Algorithmic Information Theory	**SR**	5	30/95	1/1/0/0	CS411	F/S
CS502	Algorithms for Computational Topology	**SR**	5	30/95	1/1/0/0	CS411	F/S
CS503	Introduction to Complexity Theory	**SR**	5	30/95	1/1/0/0	CS411	F/S
CS506	Functional Programming using Haskell	**SR**	5	30/95	1/1/0/0	CS212, CS204	F/S
CS508	ADO.NET technology - data access from NET application	**SR**	5	45/80	1/0/0/2	CS411	F/S
CS510	Advanced course of Algorithms	**SR**	5	45/80	2/0/0/1	CS222	F/S
CS511	Programming with Java (Advanced Course)	**SR**	5	45/80	2/0/1/0	CS101	F/S

CS513	Information Management	**SR**	5	45/80	1/1/0/1	CS310	F/S
CS514	Formal Languages and Finite Automats	**SR**	5	45/80	1/1/0/1	CS310	F/S
CS516	Genetic Algorithms	**SR**	5	45/80	1/1/1/0	CS310	F/S
CS517	Neural Networks	**SR**	5	45/80	1/1/1/0	CS310	F/S
CS518	Behavioral models of discrete systems	**SR**	5	45/80	1/2/0/0	CS310	F/S
CS 519	The Technologies of the Information Security	**SR**	5	45/80	1/0/1/1	CS105	F/S
CS520	Cryptographic Algorithms	**SR**	5	45/80	1/0/0/2	CS305	F/S
CS521	Information Theory and Coding	**SR**	5	45/80	1/0/0/2	CS302	F/S
CS530	Information Models and Systems	**SR**	5	45/80	1/0/0/2	CS202 (CS 212, CS222)	F/S
CS531	Network Technologies and Communications 2	**SR**	5	45/80	1/0/0/2	CS104, CS103	F/S
CS532	Operating System Linux for Servers	**SR**	5	45/80	1/0/2/0	CS104, CS103	F/S
CS536	Introduction to Scientific Modeling	**SR**	5	45/80	1/0/0/2	CS102, Math101	F/S
CS537	Machine Learning	**SR**	5	45/80	1/1/0/1	CS102, CS103	F/S
CS543	Introduction Bioinformatics	**SR**	5	45/80	1/0/2/0	CS310	F/S
CS555	Internship	**SR**	5				F/S

***CS Program Course Mapping to Program SLOs*.**

CS Program Courses	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**
CS 101 ICT Literacy								**L**	**L**	**L**					
CS 102 Basics of Programming	**L**	**L**			**L**									**L**	
CS 103-Introduction to Algorithms	**L**	**L**				**L**	**L**						**L**		**L**
CS 104 Objects Oriented Programming 1 (C ++)	**M**			**M**	**L**									**L**	**L**
CS 105 Data Structures	**L**		**L**	**L**	**L**		**M**								
CS 106 Algorithm Design	**L**	**L**		**M**			**M**	**M**				**M**			
CS 201- Algorithms and Complexity	**M**	**L**					**M**	**M**					**M**		**M**
CS 202(2012, 222, 232) Objects Oriented Programming 2 (Java, C#, VBA)	**H**	**H**		**M**	**M**	**H**								**H**	**M**
CS 203-Computer Architecture and Organization	**M**			**M**	**M**	**M**	**M**		**M**						

CS 204 Data Base	**H**			**M**	**H**	**M**			**M**			**H**			
CS 205 Data Analysis and Statistics	**H**			**M**	**M**	**M**	**M**	**M**							**M**
CS206- Mathematical Programming	**H**			**M**	**H**									**M**	
CS 301 Operations Research	**H**			**H**	**H**									**H**	
CS 302 Operating systems	**H**		**M**	**H**		**H**		**H**				**H**			
CS 303 Modeling and Simulation	**M**	**H**		**H**	**H**	**H**	**H**	**H**				**H**			**H**
CS 304 Web Technology		**H**		**H**	**H**	**M**								**H**	**H**
CS 305 Network Technologies and Communications	**H**	**M**		**M**	**H**	**M**	**L**		**H**					**H**	**H**
CS 401 Software Engineering	**H**			**H**	**H**	**H**	**H**							**H**	**H**
CS 402 Project Preparation			**H**				**H**	**H**		**H**	**H**	**H**	**H**		
CS 403 Intelligent Systems	**H**			**H**	**H**	**H**									
CS 404 Computer law and Ethics										**H**	**H**				
CS 405 Team Projects		**H**	**H**	**H**	**H**		**H**	**H**	**H**		**H**	**H**	**H**	**H**	**H**

H- High
M - Middle
L – Low

Necessary auxiliary conditions /resources for learning

The Department of Computer Science has nine open labs for students (rooms 407-415 and 417-419 in XI building) and one computer Lab (room 409) with Sisco research equipment. Open labs can be used by all university students including computer science students. There are 250 pieces of hardware including computers, projectors and printers in the department inventory list. Following is a list of the hardware and software in each open lab:

Room 407
Windows – 16 machines
Room 408
Windows – 16 machines
Room 409
Windows – 16 machines
Room 410
Windows - 16 machines
Room 411
Windows – 24 machines
Room 412-413
Windows – 31 machines
Room 414-415
Windows – 31 machines
Room 417
Windows – 16 machines
Room 418
Windows – 16 machines
Room 419
Windows – 16 machines

Overall 198 computers.

The following programs are running on all computers:

- **Operating systems Windows7 or Windows 10**
- **Operating system Linux;**
- **Windows Server 2016;**
- **Microsoft Office 2013, Office 2016;**
- **Visual Studio 2015, 2017;**
- **SQL Server 2012;**
- **Adobe Photoshop CS5;**
- **Adobe Dreamviewer;**
- **WAMP;**
- **Sublime;**
- **MATLAB;**
- **MATLAB & Simulink;**
- **WMware Workstation;**
- **Wolfram Mathematic 11;**
- **Microsoft Azure;**
- **Emu8086;**
- **Little Man Computer;**
- **CPU emulator;**
- **GNS3;**
- **Cisco Packet Tracer;**
- **Virtual Box 5.0;**
- **Sublime Text;**
- **Vamp Server;**
- **SPSS 20;**
- **Wire shark;**
- **Code::Blocks**
- **Shadow Defender;**
- **WinRAR;**
- **Adobe Reader.**