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

Bachelor Program

Computer Science
კომპიუტერული მეცნიერება

Academic degree:
Bachelor of Informatics
ინფორმატიკის 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 Informatics
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 • General Aptitude – minimum competence levels is determined by National Assessment and Examinations Center • Georgian Language - 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.
Program Heads	Manana Khachidze
Program Coordinator	Magda Tsintsadze
Tution fee	3 500$ or 9000 GeL one 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, such as "Computer Science", "Information systems", "Information technologies", 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 day time 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% 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:

145 ECTS - Computer Science subjects;
20 ECTS - Natural Sciences subjects;
30 ECTS - General education.

Faculty: ***Faculty of Exact and Natural Sciences***
Institute / Department / Chair / Direction: Computer Sciences
Name of the Program: ***Computer Science***
Level of training: a bachelor
Heads of Program: Manana Khachidze
Coordinator: Magda Tsintsadze
Date of approval of the Academic Council, Resolution Number:
Date of the enrollment of the academic year (academic year): 2019-2020

	Course	Subject status	ECTS	hours	Lecture / Practice / Work / Lab	Prerequisite	I Semester	II Semester	III Semester	IV Semester	V Semester	V I Semester	VII Semester	VIII Semester
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								
CS103	Introduction to Algorithms	**R**	5	60/65	2/2/0/0	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								
SC	Elective Intr Sc.1	**SR**	5	60/65	2/2/0/0	N/R								
CS104	Object Oriented Programming 1 (C ++)	**R**	5	60/65	2/2/0/0	CS102								
CS105	Data Structures	**R**	5	60/65	2/2/0/0	CS103, CS102								
CS106	Algorithm Design	**R**	5	60/65	2/2/0/0	CS103								
MaTh103	Calculus for Computer Science	**R**	5	60/65	2/2/0/0	MaTh101								
GE	Language 1	**R**	5	60/65	0/4/0/0	N/R								
SC	Natural Sciences	**SR**	5											

CS202	CS212 Object Oriented Programming 2 (C#) or CS222 Object Oriented Programming 2 (Java) or CS242 Objec Oriented Programming 2 (Pyton)		5		2/2/0/0 2/0/0/1 1/0/0/2	CS104								
CS203	Computer Architecture and Organization	**R**	5	45/80	1/0/1/1	CS104								
MaTh201	Discrete Mathematics	**R**	5	4580	2/2/0/0	MaTh102								
SC	Natural Sciences	**SR**	5											
GE	General Education	**R**	5	60/65	0/4/0/0									
GE	Language 2	**R**	5	60/65	0/4/0/0	Language 1								
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	MaTh 103								
CS304	Web Programming	**R**	5	60/65	2/0/0/2	CS104								
SC	Natural Sciences	**SR**	5											
SC	Natural Sciences	**SR**	5	60/65	2/00/2									
GE	General Education	**S**	5											
CS 512 or CS 505	Formal Language and Automata or Functional Programing	**SR**	5	45/80 45/80	1/2/0/0 1/0/1/1	CS104, CS106 CS104								
CS302	Operating systems	**R**	5	45/80	1/0/1/1	CS104								
CS303	Modeling and Simulation	**R**	5	60/65	1/0/2/1	CS205								
CS310	Algorithms and Complexity	**R**	5	45/80	2/1/0/0	CS106								
CS	CS elective	**SR**	5											
GE	General Education	**S**	5											
CS206	Mathematical Programing	**R**	5	45/80	1/2/0/0	MaTh 103								

CS305	Network Technologies and Communications	**R**	5	45/80	1/0/0/2	CS302								
CS 512 or CS 505	Formal Language and Automata or Functional Programing	**SR**	5	45/80 45/80	1/2/0/0 1/0/1/1	CS104, CS106 CS104								
CS	CS elective	**SR**	5											
CS	CS elective	**SR**	5											
GE	General Education	**S**	5											
CS401	Software Engineering	**R**	5	30/95	1/0/1/0	CS106, CS202								
CS402	Project Preparation	**R**	5	30/95	1/0/1/0	165 ECTS								
CS301	Operations Research	**R**	5	45/80	1/1/0/1	CS206								
CSEL	CS elective	**SR**	5											
GE	General Education	**S**	5											
SC	Natural Sciences	**SR**	5											
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								
CSEL	CS elective	**SR**	5											
SC	Natural Sciences	**SR**	5											
GE	General Education	**S**	5											
							30	**30**	**30**	**30**	**30**	**30**	**30**	**30**

Elective Cources

	Course	Subject status	ECTS	hours	Lecture / Practice / Work / Lab	Prerequisite	I Semester	II Semester	III Semester	IV Semester	V Semester	V I Semester	VII Semester	VIII Semester
Natural Sciences Courses														
Ph101	Introductory Physics	SR	5	60/65	2/2/0/0	N/R								
Che101	Introduction to Chemistry	SR	5	45/80	2/0/1/0	N/R								
Bio101	Introduction to Biology	SR	5	60/65	2/0/2/0	N/R								
Geo101	Introduction to Geography	SR	5	60/65	2/2/0/0	N/R								
Geol101	Introduction to Geology	SR	5	60/65	2/2/0/0	N/R								
Bio501	Genetics and Molecular Biology	SR	5	60/65	2/0/0/2	N/R								
Bio502	Human and Animal Physiology	SR	5	60/65	2/0/0/2	Bio101								
Bio503	Food and Health	SR	5	60/65	2/1/1/0	Bio101								
Geo501	Biogeography	SR	5	45/80	1/0/2/0	Geo101								
Geo502	Hydrology	SR	5	45/80	1/2/0/0	Geo101								
PHYS 105	Mechanics for Non-Physicists	SR	5	120/55	2/0/1/2	Ph101								
PHYS 106	Electromagnetism for Non-Physicists	SR	5	120/55	2/0/1/2	PHYS 105								
General Education														
GE101	Georgian Language for Foreigners 1	**R**	5	60/65	0/4/0/0	N/R								
GE102	Georgian Language for Foreigners 2	**R**	5	60/65	0/4/0/0	GE101								
GE501	Georgian Language for Foreigners 3	**S**	5	60/65	0/4/0/0	GE102								
GE502	Foundations of British Studies	**S**	5	30/95	1/0/1/0	N/R								
GE503	Georgian Mythology	**S**	5	45/80	2/0/1/0	N/R								
GE504	Practicum in Sociolinguistics	**S**	5	45/80	1/0/2/0	N/R								
GE506	Public Speaking	**S**	5	45/80	1/0/2/0	N/R								
GE507	Introduction to Psychology	**S**	5	60/65	2/0/2/0	N/R								
GE508	Principles of Macroeconomics	**S**	5	45/80	1/0/2/0	N/R								
GE509	Principles of Microeconomics	**S**	5	45/80	1/0/2/0	N/R								

Computer Science Elective courses															
CS501	Algorithmic Information Theory	**SR**	5	30/95	1/1/0/0	CS102, CS105, CS106									
CS502	Algorithms for Computational Topology	**SR**	5	30/95	1/1/0/0	CS102, CS105, CS106									
CS503	Introduction to Complexity Theory	**SR**	5	30/95	1/1/0/0	CS102, CS105, CS106									
CS506	ADO.NET technology - data access from NET application	**SR**	5	30/95	1/1/0/0	CS212, CS204									
CS508	Advanced course of Algorithms	**SR**	5	45/80	1/0/0/2	CS104 (71 points or more), CS105, CS106									
CS510	Programming with Java (Advanced Course)	**SR**	5	45/80	2/0/0/1	CS204, CS222 (minimal score of 60 poins)									
CS511	Information Management	**SR**	5	45/80	2/0/1/0	CS101									
CS513	Genetic Algorithms	**SR**	5	45/80	1/1/0/1	CS102, CS103									
CS514	Neural Networks	**SR**	5	45/80	1/1/0/1	CS102, CS103									
CS515	Behavioral models of discrete systems	**SR**	5	45/80	1/2/0/0	MaTh201									
CS516	The Technologies of the Information Security	**SR**	5	45/80	1/1/1/0	CS102, CS103									
CS517	Cryptographic Algorithms	**SR**	5	45/80	1/1/1/0	MaTh201									
CS518	Information Theory and Coding	**SR**	5	45/80	1/2/0/0	MaTh201									
CS 519	Information Models and Systems	**SR**	5	45/80	1/0/1/1	CS102									
CS520	Network Technologies and Communications 2	**SR**	5	45/80	1/0/0/2	CS305									
CS521	Operating System Linux for Servers	**SR**	5	45/80	1/0/0/2	CS302									
CS536	Introduction To Scientific Modeling	SR	5	45/80	1/0/0/2	CS102, Math101									
CS538	Algorithms for Numerical Analysis		5	SR	1/0/0/2	Math101 – Math102 – CS102									

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.**