IBSU

EDUCATIONAL PROGRAM

Coordinated with the Quality Assurance Office
Minutes № 11, September 19, 2022
Vice-rector   /Assoc. Prof. Dr. Nino Jojua/
Reviewed at the Faculty Board
Minutes №42, „26" „September", 2022 year
Dean of the Faculty   / Associate Professor Ilia Botsvadze /
Approved by the Governing Board

Minutes № 31, „26" „September", 2022 year
Rector   /Dr.Saffet Bayraktutan /

Bachelor's Educational Program

Computer Science
(English)

Tbilisi
2022 year

EDUCATIONAL PROGRAM

Name of the Educational Programme: Computer Science / კომპიუტერული მეცნიერება

Faculty: Business and Technology

Programme Coordinator(s): Affiliated Prof. Dr. Irakli Rodonaia, Phone: +995 599 243982, Email: irakli.rodonaia@ibsu.edu.ge;

Programme Co-Coordinator(s): Dr. Nikoloz Abzianidze, Phone: +995 599 98 49 48, Email: nabzianidze@ibsu.edu.ge

Education Cycle and Level of the qualification: Bachelor's (The first cycle of Higher Education, Level 6 of the NQF)

Type of the Educational Programme: Academic , Major

Detailed Field and Code (ISCED – F – 2013): 0613 Software and Applications Development and Analysis / პროგრამული უზრუნველყოფისა და აპლიკაციების განვითარება და ანალიზი

Awarded Qualification: Bachelor of Computer Science/კომპიუტერული მეცნიერების ბაკალავრი

Code of Qualification: 0613.1.2

Language of Education: English

Credit Value of the Programme: 240 ECTS

Structure of the Programme: The University uses the European Credit Transfer System (ECTS): 1 credit = 25 astronomic hours, that includes both contact and student independent work hours. The program full volume is 240 credits, which includes:

IBSU

EDUCATIONAL PROGRAM

- Academic writing -5 ECTS
- Obligatory Computer Science Courses- 142 ECTS
- Elective Computer Science Courses - 50 ECTS
- Free (including extra specialty) Courses - 43 ECTS

Programme Admission Precondition: According to the Georgian law, passing Unified National Exams is required to be admitted to the educational program. Passing Unified National Exams in English language and as a third subject - Mathematics or Physics is required. Moreover, for the English exam passing 50% + 1 is the passing threshold. Student of a bachelor program can become anyone with secondary education.

Admission to the educational program without passing Unified National exams may be allowed only in cases considered by the Georgian law. admission Preconditions for the foreigners can be found on the following link: (https://iro.ibsu.edu.ge/en/home).

Purpose of the Programme: Aims of the Bachelor Program in Computer Science are:

(1) To provide graduates with solid theoretical and practical knowledge in fundamental and modern subfields of computer science, such as mathematical foundations of computer science, algorithms and data structures, computer systems and networks and their security, databases, software engineering, computer architecture, methods of artificial intelligence and machine learning, etc.;

(2) To enable graduates to respond to the challenges related to modern technology, prepare internationally competitive specialists who will be able to work in the private or public sector;

(3) To enable graduates to pursue studies at the next level of academic education in computer science, computer engineering, information sciences, artificial intelligence, and information technology.

Learning Outcome: After completing the Bachelor Program of Computer Science, the graduate will have the following competencies necessary for his / her specialization.

EDUCATIONAL PROGRAM

Learning Outcome:	1. Demonstrates extensive knowledge of theoretical and practical issues in computer science, including the development of important aspects, principles and thesis's in the field; 2. Highlights the interdisciplinary nature of computer science, its practical importance for the analysis and modeling of theoretical tasks; 3. Defines the basic principles of software engineering and the importance of applying these principles in the implementation of the life cycle of computer programs; 4. Formulates the problem algorithmically using different programming paradigms and implements it in different programming languages; 5. Describes the fundamental principles of operation of database management systems, various data models, languages of requirements and principles of data management systems administration; 6. Describes computer architecture, principles of computer operation, physical characteristics of a computer, operating systems and their components, computer devices and their connections to operating systems; 7. Highlights the role of artificial intelligence in modern technologies and various fields of science; Conducts experiments using machine learning methods; 8. Analyzes complex problems and selects optimal methods for their solution; Performs mathematical modeling of problems, algorithmic problem solving, as well as software development, testing and modification; 9. Uses computer systems to solve various field tasks, prepares technical documentation and delivers presentations to field specialists and non-specialists; Prepares a research or practical paper in accordance with the instructions of the supervisor in computer science; Recognizes the potential ethical and social consequences of creating and using technology 10. Evaluates his / her knowledge in the field of computer science, determines the needs of further study and implements with a high degree of independence; Carries out activities in compliance with the principles of professional ethics

Program goals and learning outcomes map:

Program goals	learning outcome 1	learning outcome 2	learning outcome 3	learning outcome 4	learning outcome 5	learning outcome 6	learning outcome 7	learning outcome 8	learning outcome 9	learning outcome 10
1	✔	✔	✔	✔	✔	✔	✔	✔	✔	
2	✔	✔	✔	✔	✔	✔	✔	✔	✔	
3										✔

EDUCATIONAL PROGRAM

Learning Outcome Map:

Course / Module / Internship / Research Component	Criteria of Competencies									
	LO 1	LO2	LO3	LO4	LO5	LO6	LO7	LO 8	LO 9	LO 10
Calculus 1	1	1						1		
Linear Algebra	1	2						1		
Principles of Programing	1	1	1	3	1	1		2		
Aspects of Computer Science and Technology	2	1	1	1	1	1	1	1	1	
Physics	1	1						2		
Calculus 2	1	2						2		
Databases	1			1	3	1		2		
Object Oriented Programming	1		2	3	1	1		2	1	
Computer Architecture	1		1	1		3			1	

EDICATIONAL PROGRAM

EDUCATIONAL PROGRAM

Algorithms and Data Structures 1	1	1	1	3	1			1		
Software Development	2	1	2	2	2	1		1	1	
Discrete Mathematics	2	3		2				2		
Professional English									2	
Operating Systems	1					2		1		
Algorithms and Data Structures 2	2	2	1	3	1			2		
Academic Writing									2	
Theoretical Foundations of Computer Science	2	3		2				2		
Probability and Statistics	1	2					2	2		
Computer Networks	2					3		2		
Software Engineering	1	1	3	1	1	2		1		
Artificial Intelligence	3	2		2			3	2		
Computer Systems Security	1					3		2		
Machine Learning	3	2		2			3	2		
Programming Paradigms	2	1		2	1			2		

IBSU

EDUCATIONAL PROGRAM

Internship	3	2	2	2	2	2	2	2	2	3
Methods and instructions for preparing papers	2	1	1	1	1	1	1	1	2	3
Bachelor's Thesis	3	3	3	3	3	3	3	3	3	3

Methods of Attainment of Learning Outcomes: Study components considered by the program are carried out using following teaching and learning methods:

Lecture – Lectures involve discussion of major theoretical material, concepts, terms, etc. through ensuring students' active involvement. It is basically oriented on thorough teaching scientific theories and approaches of study material. During lectures, subject related issues are deeply explained, students are actively involved in the discussions and clear perception and comprehension of topics using brain-storming and other interactive methods.

Group work – Group work develops the knowledge and skills of planning and fulfillment of specific tasks under cooperative environment. Group work includes discussion of case studies, quizzes, practical assignments, different examples, through which students obtain skills of problem resolution in teams that in turn ensures development of team working skills and the possession of competencies of considering and accepting others opinion.

Practice / lab work – In order to ensure deep understanding and perception of the issues, practice/lab work concentrates on accurate discussion of relevant examples, cases, video materials, exercises and the ways of their resolution, which ensures the formation of students' ability to use the obtained theoretical knowledge in practice and develop analytic and creative thinking.

Seminar – The aim of seminars is to create the context for students which enables them to get the details, and better understand and realize the issues and topics discussed during lectures. Seminar is the means of knowledge transfer, involves discussion and drawing conclusions, and it is coordinated by a lecturer with certain specific objectives. Seminars are conducted in accordance to specific aims and are in line with the material covered throughout lecturers.

Individual work – Through individual work students deepen and internalize the knowledge obtained throughout the lecturers. Individual work involves searching for the materials through course-books or other sources of information, realizing and learning the obtained information; it also involves completing home-tasks. All these activities deepen the interest in certain issues, the wish to study these issues individually, they help students develop the ability of thinking individually, analyze the obtained information and draw conclusions.

The learning and teaching methods are implemented using the following activities:

EDUCATIONAL PROGRAM

Presentation (by lecturer) – The method consists of narration and speaking through which the information is provided by a teacher to a learner. Through this process teacher transfers knowledge verbally, explains the material and students obtain this knowledge through listening, memorizing and comprehension. It is important to make sure that understanding occurs and information is perceived correctly. In case of necessity additional instruction should be provided. A teacher is giving specific examples and provides detailed explanation.

Demonstration – It demonstrates information visually. It's sufficiently effective when reaching the result because it takes into consideration the interests of different students. Learning material can be demonstrated by lecturer or student. This method helps different steps of learning process to be seen visually and concretize, what should student do independently. At the same time, this strategy visually demonstrates the main point of the subject/problem.

Induction – modern, one of the most effective student-oriented methods. Major objective of this method is to collect much data and by generalizing the observed perspectives discover general principles through which it is possible to discuss the facts, cases and events and explain them. Learning is oriented at relying on facts and developing rules through generalizing these facts, thus, moving from specific facts to general rules.

Deduction – a traditional method of teaching and learning which sees a teacher as a major source of information and students learn general theories through a teacher's supervision. Deductive method of learning determines that kind of any subject knowledge, which presents the process when depending on general knowledge we discover new knowledge, so the process goes from general to concrete.

Analysis – In the modern world majority of disciplines have become complex; accordingly, courses in these fields require complex approaches. The method of analysis helps us to dismantle multi-disciplinary and inter-disciplinary courses into parts which allows dividing an issue under the study into separate aspects. This helps to discuss separate issues in details.

Synthesis – Method of synthesis means back-procedure, using some parts and making the whole with them. This method helps to see the whole problem.

Brain Storming – collecting as many/various ideas about the topic/issue as possible. The method enhances development of creative approach towards the problem. It supports the development of creative approaches when students try to see an issue from different perspectives. This approach ensures that every person is involved in the learning process. It is efficient for a large group and is used in stages**.**

Discussion / Debates – one of the most broadly spread interactive methods; discussion raises the level of student involvement; while discussion different opinions are confronted and the discussion is not limited to the questions asked by a teacher. Overall aim is to synthesis different views. This method develops students' ability of reflection and argumentation.

Project – This approach is a unity of perceptive methods, which makes it possible to solve a problem through students' independent work and presenting the achieved solutions. This approach raises students' motivation and responsibility; working on the project involves planning, research, practical activities and presenting the results; the projects are

INTERNATIONAL BLACK SEA UNIVERSITY - INTERNATIONAL BLACK SEA UNIVERSITY - INTERNATIONAL BLACK SEA UNIVERSITY - INTERNATIONAL BLACK SEA UNIVERSITY - INTERNATIONAL BLACK SEA UNIVERSITY - INTERNATIONAL BLACK SEA UNIVERSITY - INTERNATIONAL BLACK SEA UNIVERSITY -

IBSU

EDUCATIONAL PROGRAM

complete if the outcomes are presented in a xemplifyin manner through xemplifying specific results; a project could be done individually, in peer or group work; upon completion, the project is presented to a broader audience.

Presentation (by student/students) – Taking into consideration the development of technology presentation is one of the most interactive and effective ways of teaching. It is a combination of teaching and learning methods which allows a student to solve a problem through independent work and presenting the outcomes. This method raises students' motivation to work independently; it also develops specific skills – planning, researching, and presenting data in an effective manner; it develops skills to work in groups or individually.

Teaching though Electronic Sources – The method implies teaching through internet and the means of multimedia. It consists of all the components of teaching process that are realized through specific means of internet and multimedia.

Task Solving – Gradual mastering of theoretical material through solution of specific tasks that ensures development of skills of using theoretical knowledge independently. While solving the tasks the lecturer pays attention to the methods of task solution and to the relevant use of the various schemes or chart drawing techniques or to the techniques of task solution;

Problem Solving – The method of teaching that enables employment of newly obtained knowledge by students through study, analysis and solution of specific problem. While employing this method it is important to assess and analyze the results received through the solution of a specific problem. By using this method the skills and the ability of a student to use obtained knowledge in practice is developed.

Group Work – Teaching method through which students are divided into the groups and the assignments are given to each of the groups. Group members process the information individually and share their ideas to other group members at the same time. Group members may be assigned different functions depending on the objective defined by the task. This method ensures active involvement of each student in the process of teaching.

Individual Work – The method when a student individually performs the tasks and the assignments determined through the academic process.

Working with a Course-Book – Actively used method in a process of learning through which a student process given material by using given literature and other sources.

Doing Homework – Independent work when students do the home assignments determined through the academic process. Doing home assignments implies reading, processing and studying material determined through the study course as well as doing given assignments in written form or presenting them orally.

Student Knowledge Evaluation System: The goal of evaluation is to determine student's education results qualitatively in relation to academic program goals and parameters.

Student may be assessed orally and/or in a written way. A student's knowledge and skills are assessed through 100 points grading system. It consists of

midterm and final evaluations, sum of which makes up 100 points.

EDUCATIONAL PROGRAM

Grading system allows:

a) Five types of positive grades

   1) (A) Excellent – 91 – 100 points;

   2) (B) Very good – 81-90 points;

   3) (C) Good – 71-80 points;

   4) (D) Satisfactory – 61-70 points;

   5) (E) Acceptable – 51-60 points.

b) Two types of negative grades

  1) (FX) Fail – 41-50 points, meaning that a student requires some more work before passing and is given a chance to sit an additional

   examination after independent work;

  2) (F) Fail – 40 points and less, meaning that the work of a student is not acceptable and he/she has to study the subject anew.

For the midterm and final evaluations minimal passing grade is set. The final evaluation minimal passing grade must not exceed 30% of final evaluation grade.

Midterm and final evaluation grade distribution, their minimal competence levels and assessment criteria are described in the corresponding syllabus. A credit can be awarded only after the attainment of learning outcomes, envisaged by the course syllabus and following requirements:

a) Obtaining minimal competence levels set for midterm and final evaluations;

b) Obtaining minimum 51 points out of 100 points of final grade.

A student is allowed to take an additional (make-up) exam in case he/she scored 41-50 points of final 100 grade or minimum 51 points, but did not obtain minimal competence level set for final evaluation.

Considering its specification, the format and the assessment criteria of mid-term and final evaluations can be determined in the specific module/course syllabus.

Specificities of the Organization of the Teaching Process:

240 ECTS covered by the program is distributed in four academic years, eight semesters. The number of credits in each semester can be more than 30 or less than 30, but the student's annual study load should not exceed 75 (ECTS) credits. Credit counting system is based on European Credit Transfer System (ECTS): 1 credit = 25 hours, which cover

IBSU

EDUCATIONAL PROGRAM

both contact hours and student's independent working hours. In the 7 th semester, the students undergo Internship course to which 7 ECTS credits are allocated. During the same semester students have to pass the "Methods and instructions for preparing papers" course with 4 ECTS credits, which aims at preparing students for writing the bachelors thesis. In the last semester, students are obliged to take Bachelor Thesis to which 10 ECTS is allocated.

Within the program, out of 240 credits a student can choose any Minor Program (30 ECTS) throughout the university or 43 ECTS as free credits in the frame of which student is allowed to choose the course from any of the Bachelor Educational Programs throughout the university. 15 credits are allocated to Foreign Languages.

Field of Employment: The undergraduate program in Computer Science will prepare internationally competitive specialists. The knowledge and skills acquired by the graduates will enable them to respond to modern technology related challenges. Graduates will be able to be employed both the private and public sectors, where they perform professional functions both independently and in teams. In particular, they will be able to work as a software developers, software engineers, data analysts, information technology specialists, network administrators, etc. Graduates can also continue their studies at the next level of academic education in the direction of computer science, computer engineering, information science, artificial intelligence and information technologies.

Information Concerning Material Resources Necessary for the Implementation of the programme:

Information Concerning Material Resources Necessary for the Implementation of the programme: International Black Sea University is fully equipped with all the necessary material resources aimed to fulfil the educational program successfully:

- Classrooms equipped with different educational facilities;
- Computer laboratories with full internet access;
- University library equipped with modern technologies, internet, and rich paper and electronic books;
- Corresponding resources to the course relevant topics available through the electronic database of the university (through Smart portal);
- Other material resources owned by the university.
- Compulsory literature indicated in syllabuses is available in the university's library. IBSU is a registered member of the following e-libraries. IBSU is officially involved in the ELSEVIER international scientific system. IBSU staff and students are able to have an access to the Elsevier databases such as Scopus; Science Direct; Scival Funding (Funding Institutional)

  https://www.sciencedirect.com/
  https://www.scopus.com/standard/marketing.uri#basic
  https://www.fundinginstitutional.com/

EDUCATIONAL PROGRAM

IBSU

https://www.cambridge.org/core

https://read.dukeupress.edu/

https://www.elgaronline.com/

https://erj.ersjournals.com/

https://uk.sagepub.com/en-gb/eur/IMEchE

https://royalsociety.org/journals/

https://journals.sagepub.com/

https://journals.sagepub.com/

- In addition, the university has all the means for extracurricular activities for students (sports, creativity, social activities);

Information Concerning Human Resources Necessary for the Implementation of the programme:

№	Name, Last name	Academic degree	Position
1.	Besik Dundua	Doctor of Computer Science	Professor
2.	Michał Małafiejski	Doctor of Computer Science (Habilitation)	Affiliated Professor
3.	Irakli Rodonaia	PhD (Doctor of Philosophy) in Technology, Candidate of Technical Sciences	Affiliated Professor
4.	Giorgi Ghlonti	Candidate of Technical Sciences (Equivalent to PhD)	Affiliated Associate Professor
5.	Mikheil Rukhaia	Dr.Techn area of concentration Computer Science (Equivalent to PhD)	Associate Professor
6.	Diana Mchedlishvili	Candidate of physics and mathematics Sciences (Equivalent to PhD)	Affiliated Associate Professor
7.	Vakhtang Rodonaia	PhD degree in Engineering of Informatics (Equivalent to PhD)	Affiliated Associate Professor
8.	Khatuna Elbakidze	Candidate of physics and mathematics Sciences (Equivalent to PhD)	Affiliated Associate Professor
9.	Giorgi Mandaria	Candidate of Pedagogical Sciences (Equivalent of Doctor)	Affiliated Associate Professor
10.	Davit Datuashvili	Doctor of Engineering in Informatics (Equivalent to PhD)	Affiliated Assistant Professor
11.	Artiom Merabiani	Doctor of Engineering in Informatics (Equivalent to PhD)	Affiliated Assistant Professor
12.	Mariam Dedabrishvili	Doctor of Engineering in Informatics (Equivalent to PhD)	Affiliated Assistant Professor
13.	Maia Chkotua	PhD Degree in Education	Affiliated Associate Professor
14.	Tea Todua	Candidate of Technical Sciences (Equivalent to PhD)	Invited Lecturer
15.	Gela Pataraia	Master of Engineering in Computer Sciences	Invited Lecturer
16.	Anri Morchiladze	Master of Engineering in Computer Sciences	Invited Lecturer
17.	Nino Demetrashvili	Doctor of philosophy in Biostatistics	Invited Lecturer

EDUCATIONAL PROGRAM

IBSU

18.	Gvantsa Grigolia	Master of Science in Engineering	Invited Lecturer
19.	Davit Razmadze	PhD Degree in Engineering of Informatics	Invited Lecturer

Study Plan

#	Course / Module / Internship / Research Component	Status	Credit number	I Semester	II Semester	III Semester	IV Semester	V Semester	VI Semester	VII Semester	VIII Semester	Lecture / Consultation	Seminar / Group Work / Laboratory Work / Practical work	Midterm exam(s)	Final exam	Total number of contact hours	Independent work	Total number of hours	Number of contact hours per week
2	Calculus 1	Obligatory	6	6								15	28	2	2	47	103	150	3
3	Linear Algebra	Obligatory	5	5								31	12	2	2	47	78	125	3

EDUCATIONAL PROGRAM

4	Principles of Programing	Obligatory	5	5						28	15	2	2	47	78	125	3
5	Aspects of Computer Science and Technology	Obligatory	5	5						30	13	2	2	47	78	125	3
6	Physics	Obligatory	5		5					14	29	2	2	47	78	125	3
7	Calculus 2	Obligatory	6		6					15	28	2	2	47	103	150	3
8	Databases	Obligatory	5		5					26	17	2	2	47	78	125	3
9	Object Oriented Programming	Obligatory	5		5					28	15	2	2	47	78	125	3
10	Computer Architecture	Obligatory	5			5				43	-	2	2	47	78	125	3
11	Algorithms and Data Structures 1	Obligatory	6			6				29	14	2	2	47	103	150	3
12	Software Development	Obligatory	5			5				28	15	2	2	47	78	125	3
13	Discrete Mathematics	Obligatory	6				6			29	14	2	2	47	103	150	3
14	Professional English	Obligatory	4				4			31	12	2	2	47	53	100	3
15	Operating Systems	Obligatory	5				5			14	29	2	2	47	78	125	3
16	Algorithms and Data Structures 2	Obligatory	6				6			28	15	2	2	47	103	150	3
17	Academic Writing	Obligatory	5					5		15	28	2	2	47	78	125	3
18	Theoretical Foundations of Computer Science	Obligatory	6					6		29	14	2	2	47	103	150	3
19	Probability and Statistics	Obligatory	6					6		29	14	2	2	47	103	150	3

EDUCATIONAL PROGRAM

№	Subject	Type	Cr	S1	S2	S3	S4	S5	S6	S7	S8	Lec	Sem	Pr	Lab	Contact	Ind	Total	ECTS
20	Computer Networks	Obligatory	4					4				31	12	2	2	47	53	100	3
21	Software Engineering	Obligatory	5						5			30	13	2	2	47	78	125	3
22	Artificial Intelligence	Obligatory	5						5			28	15	2	2	47	78	125	3
23	Computer Systems Security	Obligatory	5						5			28	15	2	2	47	78	125	3
24	Machine Learning	Obligatory	6							6		29	14	2	2	47	103	150	3
25	Programming Paradigms	Obligatory	5							5		29	14	2	2	47	78	125	3
26	Internship	Obligatory	7							7		-	139	2	2	143	32	175	-
27	Methods and instructions for preparing papers	Obligatory	4							4		14	-	1	-	15	85	100	1
28	Bachelor's Thesis	Obligatory	10								10	-	28	1	1	30	220	250	-
29	Computer Skills	Elective	4	4								28	15	2	2	47	53	100	3
30	Web Programming 1	Elective	4	4								28	15	2	2	47	53	100	3
31	Web Programming 2	Elective	4		4							28	15	2	2	47	53	100	3
32	Information Technology Project Management	Elective	4		4							14	29	2	2	47	53	100	3
33	Geographic Information Systems	Elective	4		4							15	28	2	2	47	53	100	3
34	Front End Development using Angular	Elective	4			4						28	15	2	2	47	53	100	3

IBSU

EDUCATIONAL PROGRAM

No	Course	Type	Cr	S1	S2	S3	S4	S5								
35	3D Graphics in Blender 1	Elective	4	4					28	15	2	2	47	53	100	3
36	Administration of databases	Elective	4	4					14	29	2	2	47	53	100	3
37	Backend programming	Elective	4		4				28	15	2	2	47	53	100	3
38	Designing and building mobile applications	Elective	4		4				28	15	2	2	47	53	100	3
39	3D Graphics in Blender 2	Elective	4		4				28	15	2	2	47	53	100	3
40	Computer game programming	Elective	4			4			28	15	2	2	47	53	100	3
41	Web Applications Programming	Elective	4			4			28	15	2	2	47	53	100	3
42	Applied Cryptography	Elective	4			4			14	30	1	2	47	53	100	3
43	Differential equations	Elective	5			5			15	28	2	2	47	78	125	3
44	Virtualization technology	Elective	5				5		28	15	2	2	47	78	125	3
45	Statistical Methods in Bioinformatics	Elective	5				5		28	15	2	2	47	78	125	3
46	Programming on Python	Elective	5				5		29	14	2	2	47	78	125	3
47	Natural language processing	Elective	5					5	28	15	2	2	47	78	125	3
48	Basics of Neural Networks	Elective	5					5	15	28	2	2	47	78	125	3
49	Essentials of Ethical Hacking and Network Security	Elective	5					5	14	29	2	2	47	78	125	3

EDUCATIONAL PROGRAM

50	Programming on Matlab	Elective	5								5	29	14	2	2	47	78	125	3
51	Wireless Communication	Elective	5								5	28	15	2	2	47	78	125	3
52	Cloud computing	Elective	5								5	32	11	2	2	47	78	125	3
53	Arduino Programming	Elective	5								5	10	34	1	2	47	78	125	3
54	Computer vision	Elective	5								5	29	14	2	2	47	78	125	3
	Free Curses Foreign Language (English, Russian, German, French, Spanish, Turkish)	Elective	43 (15)	5 5	5 5	6 5	5	4	5	3	10	-	--	-	-	-	-	1075	-
Total number			**240**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**919**	**768**	**73**	**73**	**1833**	**3092**	**6000**	**106**

IBSU

EDUCATIONAL PROGRAM

Table of Requirements

#	Course title	ECTS	Prerequisite	Semester course
1	Foreign Language	15	Previous level of language	1,2,3
2	Calculus 1	6	N/A	1
3	Linear Algebra	5	N/A	1
4	Principles of Programing	5	N/A	1
5	Aspects of Computer Science and Technology	5	N/A	1
29	Computer Skills	4	N/A	1
30	Web Programming 1	4	N/A	1
6	Physics	5	N/A	2
7	Calculus 2	6	Calculus 1	2
8	Databases	5	N/A	2
9	Object Oriented Programming	5	Principles if Programing	2
31	Web Programming 2	4	Web Programming 1	2
32	Information Technology Project Management	4	Computer Skills	2
33	Geographic Information Systems	4	N/A	2
10	Computer Architecture	5	N/A	3
11	Algorithms and Data Structures 1	6	Object Oriented Programming,	3
12	Software Development	5	Object Oriented Programming	3
34	Front End Development using Angular	4	Web Programming 2	3
35	3D Graphics in Blender 1	4	N/A	3
36	Administration of databases	4	Databases	3
13	Discrete Mathematics	6	N/A	4
14	Professional English	4	N/A	4
15	Operating Systems	5	Computer Architecture	4
16	Algorithms and Data Structures 2	6	Algorithms and Data Structures 1	4
37	Backend programming	4	Web Programming 2	4
38	Mobile App Development	4	Software Development, Professional English	4
39	3D Graphics in Blender 2	4	3D Graphics in Blender 1	4
17	Academic Writing	5	Professional English	5

EDUCATIONAL PROGRAM

18	Theoretical Foundations of Computer Science	6	Discrete Mathematics,	5
19	Probability and Statistics	6	Calculus 2, Calculus 1,	5
20	Computer Networks	4	Computer Architecture,	5
40	Game Development	4	3D Graphics in Blender 2	5
41	Web Applications Development	4	Software Development, Web Programming 2,	5
42	Applied Cryptography	4	Calculus 2, Discrete Mathematics,	5
43	Differential equations	5	Calculus 2,	6
21	Software Engineering	5	Principles of Programing,	6
22	Artificial Intelligence	5	Theoretical Foundations of Computer Science,	6
23	Computer Systems Security	5	Computer Networks,	6
44	Virtualization technology	5	Computer Networks,	6
45	Statistical Methods in Bioinformatics	5	Probability and Statistics	6
46	Programming on Python	5	Principles of Programing	6
24	Machine Learning	6	Probability and Statistics, Artificial Intelligence, Principles of Programing, Linear Algebra	7
25	Programming Paradigms	5	Object Oriented Programming,	7
26	Internship	7	Must be completed all Compulsory Courses	7
27	Methods and instructions for preparing papers	4	Academic Writing, Professional English	7
47	Natural language processing	5	Artificial Intelligence	7
48	Introduction of Neural Networks	5	Artificial Intelligence, Principles of Programing	7
49	Essentials of Ethical Hacking and Network Security	5	Computer Systems Security	6
28	Bachelor's Thesis	10	Must be completed all Compulsory Courses	8
50	Programming on MATLAB	5	Principles of Programming	8
51	Wireless Communication	5	Computer Networks,	8
52	Cloud computing	5	Computer Systems Security	8
53	Arduino Programming	5	Physics, Principles of Programing	8
54	Computer vision	5	Machine Learning, Programming on Python	8

* - List all those courses which are necessary for a student to pass in order to take a particular course/block/module

EDUCATIONAL PROGRAM

Additional Table of Study Plan

№	Course / Module / Internship / Research Component	Code	Semester	Prerequisites	Lecturer
2	Calculus 1	CS102	1	N/A	Diana Mchedlishvili
3	Linear Algebra	CS110	1	N/A	Diana Mchedlishvili
4	Principles of Programing	CS104	1	N/A	Anri Morchiladze
5	Aspects of Computer Science and Technology	CS105	1	N/A	Gela Pataraia
6	Physics	CS106	2	N/A	Khatuna Elbakidze
7	Calculus 2	CS107	2	Calculus 1	Diana Mchedlishvili
8	Databases	CS108	2	N/A	Vakhtang Rodonaia
9	Object Oriented Programming	CS109	2	Principles of Programing	Michał Małafiejski
10	Computer Architecture	CS103	3	N/A	Irakli Rodonaia
11	Algorithms and Data Structures 1	CS111	3	Object Oriented Programming.	Giorgi Mandaria
12	Software Development	CS112	3	Object Oriented Programming.	Giorgi Ghlonti
13	Discrete Mathematics	CS113	4	N/A	Michał Małafiejski
14	Professional English	CS114	4	N/A	Gela Pataraia
15	Operating Systems	CS115	4	Computer Architecture	Vakhtang Rodonaia
16	Algorithms and Data Structures 2	CS116	4	Algorithms and Data Structures 1	Giorgi Mandaria

IBSU

EDUCATIONAL PROGRAM

17	Academic Writing	BUS119	5	Professional English	Maia Chkotua
18	Theoretical Foundations of Computer Science	CS118	5	Discrete Mathematics,	Mikheil Rukhaia
19	Probability and Statistics	CS119	5	Calculus 2	Davit Datuashvili
20	Computer Networks	CS120	5	Computer Architecture,	Vakhtang Rodonaia
21	Software Engineering	CS121	6	Principles of Programing,	Giorgi Ghlonti
22	Artificial Intelligence	CS122	6	Theoretical Foundations of Computer Science,	Mikheil Rukhaia
23	Computer Systems Security	CS123	6	Computer Networks,	Vakhtang Rodonaia
24	Machine Learning	CS124	7	Probability and Statistics; Artificial Intelligence, Principles of Programing, Linear Algebra,	Mariam Dedabrishvili
25	Programming Paradigms	CS125	7	Object Oriented Programming,	Besik Dundua
26	Internship	CS126	7	Must be completed all Compulsory Courses	Besik Dundua
27	Methods and instructions for preparing papers	CS127	7	Academic Writing, Professional English	All academic staff
28	Bachelor's Thesis	CS128	8	Must be completed all Compulsory Courses	All academic staff
29	Computer Skills	CS129	1	N/A	Gela Pataraia
30	Web Programming 1	CS130	1	N/A	Mikheil Rukhaia
31	Web Programming 2	CS131	2	Web Programming 1	Mikheil Rukhaia
32	Information Technology Project Management	CS132	2	Computer Skills	Tea Todua
33	Geographical Information System (GIS)	CS133	2	N/A	Giorgi Ghlonti
34	Front End Development using Angular	CS134	3	Web Programming 2	Artioma Merabiani

EDUCATIONAL PROGRAM

35	3D Graphics in Blender 1	CS135	3	<u>N/A</u>	Gela Pataraia
36	Administration of databases	CS136	3	Databases	Mikheil Rukhaia
37	Backend programming	CS137	4	Web Programming 2	Anri Morchiladze
38	Designing and building mobile applications	CS138	4	Object Oriented Programming	Artiom Merabiani
39	3D Graphics in Blender 2	CS139	4	3D Graphics in Blender 1	Gela Pataraia
40	Computer game programming	CS140	5	3D Graphics in Blender 2	Artiom Merabiani
41	Web Applications Programming	CS141	5	Web Programming 2, Software Engineering	Mikhail Rukhaia
42	Applied Cryptography	CS142	8	Calculus 2, Discrete Mathematics	Gvantsa Griogolia
43	Differential equations	CS143	6	Calculus 2	Diana Mchedlishvili
44	Virtualization technology	CS144	5	Computer Networks	Irakli Rodonaia
45	Statistical Methods in Bioinformatics	CS145	6	Probability and Statistics	Nino Demetrashvili
46	Programming on Python	CS147	6	Principles of Programing	David Razmadze
47	Natural language processing	CS146	7	Artificial Intelligence	Besik Dundua
48	Basics of Neural Networks	CS148	7	Artificial Intelligence, Principles of Programing	Tea Todua
49	Essentials of Ethical Hacking and Network Security	CS149	7	Computer Systems Security	David Razmadze
50	Programming on Matlab	CS150	8	Probability and Statistics	Khatuna Elbakidze
51	Wireless Communication	CS151	8	Computer Networks	Vakhtang Rodonaia
52	Cloud computing	CS152	8	Computer Systems Security,	Irakli Rodonaia
53	Arduino Programming	CS153	8	Physics, Principles of Programing,	Tea Todua

EDUCATIONAL PROGRAM

| 54 | Computer vision | CS154 | 8 | Machine Learning; Programming on Python | Davit Datuashvili |