საქართველოს ტექნიკური უნივერსიტეტი
GEORGIAN TECHNICAL UNIVERSITY

Approved by
Academic Council of GTU
Year Day Month
Order №

Bachelor's Educational Program

Program Title

დიდ მონაცემთა სისტემები
Big Data Systems

Faculty

ინფორმატიკისა და მართვის სისტემების ფაკულტეტი
Faculty of Informatics and Control Systems

Program Supervisor

Professor Kartlos Kachiashvili

Qualification to be Awarded, and the Number of Credits in the Program

Bachelor of Informatics will be awarded in case of passing basic 210 credits of the program and free components (30 credits) for accumulation not less than 240 credits.

The Language of Teaching

English

Admission Prerequisites to the Program

An applicant has the right of teaching on foreign educational program when he has the permission in accordance with Georgian legislation. The applicant must have the certificate confirming the knowledge of English on the level not less than B2.2 or must present international certificate TOEFEL (The Test of English as a Foreign Language) of II certification level. The applicant is free from the necessity of presenting a certificate confirming his/her competence at having completed course in the English language that is the educational language of the program was English. At not having appropriate certificate or other analogous document, the applicant will have an interview in English. The interview will be implemented with the temporary commission completed by the experts from the staff of GTU.

Program Description

Content, training methods and number of the credits of learning courses of the program provides achievement of a goal and results.

The program follows the ECTS system, 1 credit equals to 25 hours, which includes the contact hours, as well as the hours of independent work. The distribution of hours is presented in the educational plan. The duration of the program is 4 years (8 semesters, 60 credits in a year) and it contains not less than 240 credits. For getting Bachelor's degree the student must master 240 credits. From here 210 credits are the credits of basic specialty which contains: mathematics, physics, English, information technologies, computer engineering and computer science obligatory and selective subjects. 30 credits are the credits of the University's general educational courses for free components. From 210 credits of basic specialty 198 credits are obligatory and 12 credits are selective. 6 credits are selected out for teaching practice.

The annual learning process contains two semesters, with duration 21 weeks each of them. Student's estimations are realized by means of current activities, intermediate exams and final/extra exams. The duration of the learning process is 15 weeks. The dates of intermediate and final exams are regulated every year. The student has a right to pass final exam when he collected no less of 15 points by intermediate estimation. Minimal positive assessment of the final/extra exam is 10 points. A semester contains 30 credits and, accordingly, a year contains 60 credits. Estimation of the student's knowledge is realized by maximum 100 points, from which 30 points are estimations for current activities that are realized during 15 weeks (home work, tests, presentations in the class, participation in an individual or team project and so on). Estimation forms of intermediate and final exams differ for different educational courses and described in details in the courses syllabi.

Educational program contains different targeted educational courses in the semesters.

The first, second and third annual learning process: during I, II and III semester a student learns six courses (in I and II semesters four of the courses contains 5 credits, one – 4 credits and one – 6 credits, in III semester all of six courses contains 5 credits) which in a semester gives 30 credits. The courses belong to mathematics, physics, English, information technologies, fundamentals of computer engineering and computer science. During IV and V semester a student learns five courses with 6 credits each, and in VI semester from five courses with 6 credits only four are obligatory and from two selective courses only one is obligatory and teaching practice with 6 credits. Overwhelming of them belong to the specialty of the program, others are necessary for broadening and deepening of the knowledge and understanding of the specificity of the specialty.

In the first semester of the **fourth year** only two from five courses with six credits is obligatory for a student and from three selective courses only one is obligatory and final project with 12 credits. In the second semester of the **fourth year** from free components student choose courses so that the sum of selected courses was not less than 30 credits.

There were used many educational programs of data sciences of the bachelor level of well known in the world universities at development of the program. For example, see following sites:

1. http://www.mastersportal.eu/study-options/269779226/data-science-big-data-united-states.html
2. http://www.lookatme.ru/mag/how-to/jobs/202299-big-data
3. https://yandex.ru/search/?text=Universities%20that%20specialize%20in%20data%20science%2C%20Big%20Data%20Analytics&lr=10277&p=2
4. http://dsa.missouri.edu/
5. http://www.nu.edu/OurPrograms/SchoolOfEngineeringAndTechnology/ComputerScienceAndInformationSystems/Programs/MasterofScienceinDataAnalytics.html
6. http://future.theoryandpractice.ru/12109
7. http://changellenge.com/business-analytics-and-big-data/

The program is also developed in accordance with the ABET accreditation standards and it corresponds to ABET accredited bachelor programs (<http://main.abet.org/aps/accreditedprogramsearch.aspx>) in computer science by structure and organization:

1. Abilene Christian University) (USA) http://catalog.acu.edu/preview_program.php?catoid=2&poid=444
2. California State University (USA) http://www.calstatela.edu/ecst/cs/student-handbook http://www.calstatela.edu/sites/default/files/groups/Department%20of%20Computer%20Science/cs_undergraduate_student_handbook_2018.pdf
3. San Diego State University) (USA) https://curriculum.sdsu.edu/catalog/2017-

2018/GeneralCatalog/!GeneralCatalog-full-cover-17-18.pdf
4. Illinois State University (USA) https://web.iit.edu/sites/web/files/departments/academic-affairs/undergraduate-academic-affairs/pdfs/2018-2019_UG_Bulletin_final.pdf
5. Michigan Technology University (USA) https://www.mtu.edu/cs/undergraduate/computer-science/
and others http://main.abet.org/aps/Accreditedprogramsearch.aspx

Program Objective

The aim of the program is to give to a Bachelor the knowledge about basic problems of the big data systems. It will be systematical, methodological, information-technological and information-analytical knowledge on the modern level that will allow bachelor successfully to realize the exploitation, the realization and the regulation of consumer service. He also will be able to participate in projection, integration and introduction of software of modern big data systems, among them the systems with data basis, data processing, special software and computer nets under guidance of the experts in these subjects.

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

- Knowledge and understanding

- wide knowledge of the sphere of big data systems;
- critical estimation of current achievements and novelties in the sphere of big data systems;
- understanding complex questions of big data systems;
- interpretation of theories and principles, in particular, theoretical and practical knowledge of big data systems which is basis of the development of necessary abilities for the experts of the service of the data base and of computer networks;
- investigation of information processes and organizational management, of software, technical, organizational support and informational security;
- understanding specific questions of the sphere of big data system;
- ability of processing of big data and to understand and to interpret obtained results.

- Applying knowledge

- to use the methods characterized for big data systems and some special methods as well for solving arose problems, for realization of research or practical project in accordance with beforehand defined instructions;
- to use information technologies, among them personal computer systems; practical application of the basis of modelling, algorithmization and programming;
- to take part in projection, elaboration, integration and introduction of informational and big data systems;
- independent exploitation, service and debugging of software of computers systems, among them the systems with data bases and big data systems;
- independent exploitation, service and debugging of software of computers networks.

- Making judgments

- recognition of clearly emphasized problems, comparison of situations, their analysis with standard methods and formation of argued conclusions;
- data collection characterized for the sphere of big data systems, their analysis and explanation, analysis of alienated data and/or situation as well with standard and some special methods and formation of argued conclusion on their basis;
- argued judgment about basic information and fundamental principles of the sphere of big data

systems.

- Communication skills
  - the preparation of detailed written report about ideas, existing problems and ways of solution and verbal communication with experts and non experts of big data systems in English, creative use of modern informational and communicational technologies;
  - the ability of communication in English;
  - laconic, clear and grammatical writing;
  - public presentation of own thoughts with the appropriate knowledge and logic and their clear argumentation as with experts so with non experts;
  - creative use of modern informational and communicational technologies.
- Learning skills
  - to determine the learning directions with taking into account existed environment and priorities;
  - consequent and multilateral estimation of own learning process;
  - to decide the necessity of future training.
- Values
  - the knowledge and the estimation of the principles and values of the sphere of big data systems;
  - the participation in the process of formation of values and striving for their founding;
  - the protection of professional values (accuracy, punctuality, objectivity, transparency, good organization and others);
  - the protection of accepted norms of ethics.

Methods (teaching - learning) of Achieving Learning Outcomes

☒ Lecture ☒ Seminar (working in groups) ☒ Practical class ☒ Laboratory ☒ Practice
☒ Course work/project ☒ Consultation ☒ Independent work

Based on the specifics of a learning course, the appropriate activities listed below are employed, reflected in the relevant learning courses (syllabi):
(discussions, debates, presentations, working in groups, etc.)

Teaching and learning methods: in the process of teaching, on the basis of the specificity of learning course, the following teaching methods are used:

1. **Discussion/debate.** This is the most widely spread method of interactive teaching. A discussion process greatly increases the quality of students' involvement and their activity. A discussion may turn into an argument and this process is not merely confined to the questions posed by the teacher. It develops students' skills of reasoning and substantiating their own ideas.
2. **Cooperative learning** is a teaching strategy in the process of which each member of a group not only has to learn the subject himself, but also to help his fellow-student to learn it better. Each member of the group works at the problem until all of them master the issue.
3. **Collaborative work**: using this method implies dividing students into separate groups and giving each group its own task. The group members work at their issues individually and at the same time share their opinions with the rest of the group. According to the problem raised, it is possible to shift the functions among the group members in this process. This strategy ensures the students' maximum involvement in the learning process.
4. **Problem based learning** is based on the step-by-step solving of a given problem. It is realized by means of independent fixing of the facts in the teaching process and determining the ties among them.

5. **Case study** – the teacher discusses concrete cases together with the students and they study the issue thoroughly.
6. **Brain storming** – this method implies forming and presenting as many radically different ideas and opinions on a given topic as possible. This method sets conditions for developing a creative approach towards a problem. This method is effective in a large group of students and consists of the following stages:
    - using a creative approach for defining a problem/issue;
    - for a certain period of time listing (mainly on the blackboard) students' ideas on the problem without any criticism;
    - determining the evaluation criteria for stating the correspondence of the idea to the aim of the research;
    - evaluating the chosen ideas according to the previously determined criteria;
    - selecting the ideas that most of all correspond to the given issue by applying the method of exclusion;
    - revealing the best idea for solving the given problem
7. **Role and situational games** – games played according to a previously prepared scenario enable students to estimate the problem from different standpoints. They help students to form alternative points of view. Such games as well as discussions help students to develop skills of independently expressing their own ideas and participating in discussions.
8. **Implication** implies presenting information with the help of visual aids. It is quite effective in reaching the required result. It is frequently advisable to present the material simultaneously through audio and visual means. The material can be presented both by a teacher and a student. This method helps us to make different steps of perceiving the teaching material more obvious, specify what steps the students are supposed to take independently; at the same time this strategy visually shows the essence of an issue/problem. Demonstration can be very simple.
9. **Induction** determines such a form of conveying any kind of knowledge when in the process of learning the train of thought is oriented from facts towards generalization, i.e. while presenting the material the process goes from concrete to general.
10. **Deduction** determines such a form of conveying any kind of knowledge which presents a logical process of discovering new knowledge on the basis of general knowledge, i.e. the process goes from general to concrete.
11. **Analysis** helps us to divide the whole teaching material into constituent parts. In this way the detailed interpretation of separate issues within the given complex problem is simplified.
12. **Synthesis** implies forming one issue from several separate ones. This method helps students to develop the ability of seeing the problem as a whole.
13. **Verbal or oral transmitted** comprises a lecture, narration, conversation, etc. During the process the teacher conveys, explains the material verbally, and students perceive and learn it by comprehending and memorizing.
14. **The script** implies the following forms of activity: making extracts, records, notes, theses, abstract or essay and other.
15. **Explanation** is based on discussing a given issue. In the process of explaining the material the teacher brings concrete examples the detailed analysis of which is made in the framework of the given topic.
16. **Activity-oriented training** implies teachers' and students' active involvement in the teaching process, when practical interpretation of the theoretical material takes place.
17. **Project planning and presentation.** While designing a project a student applies the knowledge and skills he has acquired for solving a problem. Teaching by means of designing projects increases students' motivation and responsibility. Working on a project involves the stages of

planning, research, practical activity and presenting the results according to the chosen issue. The project is considered to be completed if its results are presented clearly, convincingly, and correctly. It can be carried out individually, in pairs or in groups; also, within the framework of one or several subjects (integration of subjects); on completion the project is presented to a large audience.

Concrete teaching methods are reflected in appropriate courses programs (syllabi).

Student Knowledge Assessment System

Grading system is based on a 100-point scale.

Positive grades:

- **(A)** - Excellent - grades between 91-100 points;
- **(B)** – Very good - grades between 81-90 points
- **(C)** - Good - grades between 71-80 points
- **(D)** - Satisfactory - grades between 61-70 points
- **(E)** - Pass - the rating of 51-60 points

Negative grades:

- **(FX)** - Did not pass - grades between 41-50 points, which means that the student is required to work more to pass and is given the right, after independent work, to take one extra exam;
- **(F)** – Failed - 40 points and less, which means that the work carried out by the student did not bring any results and he/she has to learn the subject from the beginning.

The criteria of the assessment of syllabuses are the conformity of the content of studying course with the aims of the course and with the results of teaching; perfect presentation of the results of study; the conformity between the aims of the course and the results of studying; the conformity between the results of studying and the methods of assessment.

Here is defined its own share for each assessment form and component in the final estimation, from the common estimation points (100 points). In particular, maximum point of intermediate estimation is 60, and maximum point of final exam is – 40. The minimum competency limit is defined in each estimation form. Minimal positive point of final exam is 10, maximum point of intermediate exam is 30. Minimal positive estimation is 7.5 points, maximum point of current activity is 30, minimum summary positive estimation is 15 points.

Estimation forms:

- ❖ intermediate estimation;
- ❖ final/extra exam.

The components of intermediate estimation are:

- intermediate exam;
- the estimation of current activity;
  - ➢ testing with open or closed questions;
  - ➢ fulfillment of practical/theoretical home-work;
  - ➢ thematic project;
  - ➢ course work/course project;

- written or/and oral examination;
- activity at the laboratory;
- activity at the seminar;
- participation in the discussions;
- case.

There is a middle-semester exam. It is an essential component of intermediate estimation.

The estimation method are:

- testing with closed questions;
- testing with open questions;
- written examination with questions;
- description/making of a laboratory work;
- examination with open text or questions;
- examination with closed text or questions;
- ability of fulfilling and defense of the project.

Sphere of Employment

Organizations and companies which perform: computer systems, built-in data bases, enterprise and computer networks design and service; administration of computer networks and systems.

Organizations and companies which perform: engineering, economical and financial computations; design, integration and implementation of program, technical, technological, organizational support of information systems; design, integration and implementation of information safety systems. The spheres of employment are: energy, military, economy, communication, medicine, environment, agriculture, metallurgical and chemical industries, food, building and other industrial objects; also banking organizations, research institutes, planning and design offices.

Potential for Further Education

Master's Educational Programs

Human and Material Resources Required to Implement the Program

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

The Number of Syllabi Attached: 51

Courses in the Program

№	Course	Admission Prerequisites	ECTS Credits							
			Year I		Year II		Year III		Year IV	
			Semester							
			I	II	III	IV	V	VI	VII	VIII
1	Engineering Mathematics 1	None	5							

2	General Physics 1	None	4							
3	Fundamentals of Computer Architecture and Organization	None	5							
4	Algorithmization Fundamentals and Programming Elements	None	6							
5	Introduction to Information Technologies	None	5							
6	Foreign Language (English) – B2 + 1	None	5							
7	Engineering Mathematics 2	Engineering Mathematics 1		5						
8	General Physics 2	General Physics 1		4						
9	Operating Systems Fundamentals	None		5						
10	Object-oriented Programming – 1 (based on C++/C#)	Algorithmization Fundamentals and Programming Elements		5						
11	Foreign Language (English) – B2+ 2	Foreign Language (English) – B2 + 1		5						
12	Fundamentals of Database Systems	Introduction to Information Technologies		6						
13	Engineering Mathematics 3.1	Engineering Mathematics 2			5					
14	Object-oriented Programming – 2 (based on Java)	Object-oriented Programming – 1 (based on C++/C#)			5					
15	Introduction to Computer Network	Introduction to Information Technologies, Fundamentals of Computer Architecture and Organization.			5					
16	Database Management System Oracle	Fundamentals of Database Systems			5					
17	Fundamentals of probability theory	Engineering Mathematics 2			5					
18	Optimization Methods	Engineering Mathematics 2			5					

19	Basics of Web Technologies	Introduction to Information Technologies				6				
20	Introduction to Information Security	Introduction to Computer Network				6				
21	Distributed Database Systems	Fundamentals of Database Systems, Database Management System Oracle				6				
22	Discrete Mathematics	No prerequisites				6				
23	Statistical Models and Simulation by SPSS	Fundamentals of probability theory, Engineering Mathematics 3.1, Optimization Methods				6				
24	Big Data Fundamentals	Statistical Models and Simulation by SPSS, Distributed Database Systems					6			
25	Introduction to Machine Learning	Statistical Models and Simulation by SPSS, Optimization Methods					6			
26	Data Warehousing Fundamentals	Database Management System Oracle, Distributed Database Systems, Introduction to Information Security					6			
27	Programig on Python	Algorithmization Fundamentals and Programming Elements, Object-oriented Programming – 2					6			

		(based on Java)								
28	Fundamentals of Artificial Intelligence	Fundamentals of probability theory, Discrete Mathematics					6			
29	Data Mining and Knowledge Discovery for Big Data	Big Data Fundamentals, Statistical Models and Simulation by SPSS, Introduction to Machine Learning						6		
30	Introduction to Grid Computing	Operating Systems Fundamentals, Basics of Web Technologies						6		
31	Cloud computing	Basics of Web Technologies, Distributed Database Systems						6		
32	Teaching practice	Fundamentals of Artificial Intelligence, Data Warehousing Fundamentals, Introduction to Machine Learning.						6		
	Selective 1									
33.1	Computer Network Organization	Introduction to Computer Network, General Physics 2						6		
33.2	Cognitive computing and Big Data Analytics	Fundamentals of Artificial Intelligence, Introduction to Machine Learning								
34	Big Data Storage and Processing System Hadoop	Basics of Web Technologies, Data Warehousing							6	

		Fundamentals, Statistical Models and Simulation by SPSS, Programing on Python								
35	Introduction to Multi-method Modeling and Simulation	Statistical Models and Simulation by SPSS, Introduction to Grid Computing							6	
	Selective 2									
36.1	Geographic Information Systems (GIS) Fundamentals	DataBase Management System Oracle, Computer Network Organization, Statistical Models and Simulation by SPSS							6	
36.2	Knowledge Representation and Reasoning	Data Warehousing Fundamentals, Fundamentals of Artificial Intelligence, Introduction to Machine Learning								
36.3	Business Intelligence for Decision Making	DataBase Management System Oracle, Statistical Models and Simulation by SPSS								
37	Final Project in Cloud/or Grid computing and/or Big Data Processing	Cloud computing, Data Warehousing Fundamentals, Data Mining and Knowledge Discovery for Big Data, Introduction to Grid Computing, Teaching practice.							12	

	Free components									
38	Bases of Policy	None								5
39	Cultural Studies	None								5
40	Environment Protection and Ecology	None								3
41	History and Culture of Georgia	None								5
42	Introduction to Ergonomics	None								5
43	Introduction to Philosophy	None								5
44	Job Analysis Methods	None								5
45	Philosophy and the History of Ideas	None								5
46	Principles of Contemporary Management	None								5
47	Principles of Economics	None								5
48	Sociology	None								5
		Per Semester	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**
		Per Year	**60**		**60**		**60**		**60**	
		Total	**240**							

Learning Outcomes Map

№	Subject	Knowledge and understanding	Applying knowledge	Making judgments	Communication skills	Learning skills	Values
1	Engineering Mathematics 1	X	X			X	
2	General Physics 1	X		X		X	
3	Fundamentals of Computer Architecture and Organization	X	X			X	
4	Algorithmization Fundamentals and Programming Elements	X	X	X		X	
5	Introduction to Information Technologies	X	X		X	X	
6	Foreign Language (English) – B2+ 1	X	X		X	X	
7	Engineering Mathematics 2	X	X			X	
8	General Physics 2	X		X		X	
9	Operating Systems Fundamentals	X	X			X	
10	Object-oriented Programming – 1(based on C++/C#)	X	X			X	

11	Foreign Language (English) – B2+ 2	X	X		X	X	
12	Fundamentals of Database Systems	X	X	X			
13	Engineering Mathematics 3.1	X	X			X	
14	Object-oriented Programming – 2 (based on Java)	X	X			X	
15	Introduction to Computer Network	X	X			X	
16	Database Management System Oracle	X	X			X	
17	Fundamentals of probability theory	X	X	X			
18	Optimization Methods	X	X	X	X	X	
19	Basics of Web Technologies	X	X	X	X	X	
20	Introduction to Information Security	X	X	X			X
21	Distributed Database Systems	X	X	X		X	
22	Discrete Mathematics	X	X			X	
23	Statistical Models and Simulation by SPSS	X	X	X		X	
24	Big Data Fundamentals	X		X		X	
25	Introduction to Machine Learning	X	X	X	X		
26	Data Warehousing Fundamentals	X	X			X	
27	Programig on Python	X	X		X		
28	Fundamentals of Artificial Intelligence	X	X	X		X	
29	Data Mining and Knowledge Discovery for Big Data	X	X			X	
30	Introduction to Grid Computing	X	X			X	
31	Cloud computing	X	X			X	
32	Teaching practice		X	X	X		
33.1	Computer Network Organization	X	X	X			
33.2	Cognitive computing and Big Data Analytics	X	X	X		X	
34	Big Data Storage and Processing System Hadoop	X	X	X		X	
35	Introduction to Multi-method Mode-ling and Simulation	X	X	X		X	
36.1	Geographic Information Systems (GIS) Fundamentals	X	X	X		X	
36.2	Knowledge Representation and Reasoning	X	X	X		X	
36.3	Business Intelligence for Decision Making	X	X			X	
37	Final Project in Cloud computing and/or Big Data Processing		X	X		X	
38	Bases of Policy	X	X			X	
39	Cultural Studies	X	X	X	X	X	X
40	Environment Protection and Ecology	X	X				X
41	History and Culture of Georgia	X	X	X	X		
42	Introduction to Ergonomics	X	X		X	X	
43	Introduction to Philosophy	X	X		X	X	X
44	Job Analysis Methods	X	X		X		X
45	Philosophy and the History of Ideas	X	X	X	X	X	
46	Principles of Contemporary Management	X	X	X			X
47	Principles of Economics	X	X	X	X	X	X
48	Sociology	X	X	X	X	X	X

Program Curriculum

№	Subject code	Subject	ECTS Credit/Hours	Hours								
				Lecture	Seminar (work in the group)	Practical classes	Laboratory	Practice	Course work/project	Mid-semester exam	Final exam	Independent work
1	MAS30108E1-LP	Engineering Mathematics 1	5/125	30		15				1	2	77
2	PHS55708E1-LB	General Physics 1	4/100	15			15			1	2	67
3	ICT14508E2-LB	Fundamentals of Computer Architecture and Organization	5/125	15		30				1	2	77
4	ICT32808E2-LPB	Algorithmization Fundamentals and Programming Elements	6/150	15		15	30			1	2	87
5	ICT14608E2-LB	Introduction to Information Technologies	5/125	15			30			1	2	77
6	LEH14112E3-LS	Foreign Language (English) – B2+1	5/125			45				1	1	78
7	MAS30208E1-LP	Engineering Mathematics 2	5/125	30		15				1	2	77
8	PHS55808E1-LB	General Physics 2	4/100	15			15			1	2	67
9	ICT32908E2-LB	Operating Systems Fundamentals	5/125	15			30			1	2	77
10	ICT33008E2-LB	Object-oriented Programming – 1 (based on C++/C#)	5/125	15			30			1	2	77
11	LEH14212E3-LS	Foreign Language (English) – B2+2	5/125			45				1	1	78
12	ICT25408E1-LP	Fundamentals of Database Systems	6/150	30		30				1	2	87
13	MAS30408E1-LP	Engineering Mathematics 3.1	5/125	30		15				1	2	77
14	ICT33108E2-LB	Object-oriented Programming – 2 (based on Java)	5/125	15			30			1	2	77
15	ICT25308E1-LB	Introduction to Computer Network	5/125	15			30			1	2	77
16	ICT25508E1-LB	Database Management System Oracle	5/125	15			30			1	2	77
17	MAS10308E2-LP	Fundamentals of probability theory	5/125	15		30				1	2	77
18	MAS10408E2-LS	Optimization Methods	5/125	15	30					1	2	77
19	ICT14708E2-LB	Basics of Web Technologies	6/150	30			30			1	2	87

20	ICT25708E1-LB	Introduction to Information Security	6/150	30			30			1	2	87
21	ICT25808E1-LB	Distributed Database Systems	6/150	30			30			1	2	87
22	MAS10508E2-LP	Discrete Mathematics	6/150	30		30				1	2	87
23	MAS24108E1-LB	Statistical Models and Simulation by SPSS	6/150	30			30			1	2	87
24	ICT25908E1-LB	Big Data Fundamentals	6/150	30			30			1	2	87
25	ICT25908E1-LB	Introduction to Machine Learning	6/150	30		15			15	1	2	87
26	ICT25908E1-LB	Data Warehousing Fundamentals	6/150	30		30				1	2	87
27	ICT33208E2-LB	Programig on Python	6/150	30			30			1	2	87
28	ICT15108E2-LP	Fundamentals of Artificial Intelligence	6/150	30		30				1	2	87
29	ICT26208E1-LP	Data Mining and Knowledge Discovery for Big Data	6/150	30		30				1	2	87
30	ICT26308E1-LP	Introduction to Grid Computing	6/150	30			15		15	1	2	87
31	ICT26408E1-LP	Cloud computing	6/150	30		30				1	2	87
32	ICT26508E1-R	Teaching practice	6/150					60		1	2	87
33.1	ICT25608E1-LPB	Computer Network Organization	6/150	30		15	15			1	2	87
33.2	ICT26708E1-LS	Cognitive computing and Big Data Analytics	6/150	30		30				1	2	87
34	ICT26808E1-LB	Big Data Storage and Processing System Hadoop	6/150	30			30			1	2	87
35	MAS24208E1-LB	Introduction to Multi-method Mode-ling and Simulation	6/150	30			30			1	2	87
36.1	ICT26908E1-LB	Geographic Information Systems Fundamentals	6/150	30			30			1	2	87
36.2	ICT27008E1-LP	Knowledge Representation and Reasoning	6/150	30		30				1	2	87
36.3	ICT27108E1-LP	Business Intelligence for Decision Making	6/150	30		30				1	2	87
37	ICT27208E1-K	Final Project in Cloud computing and/or Big Data Processing	12/300						150	5	10	135
38	SOS24911E2-LSP	Bases of Policy	5/125	15	22	8				1	2	77
39	SOS44811E1-LS	Cultural Studies	5/125	15	30					2	2	76
40	ENVPR04EA1-LB	Environment Protection and Ecology	3/75	15			15			1	1	43
41	HEL28812E1-LS	History and Culture of Georgia	5/125	15	30					1	1	78

42	ART11909E1-LS	Introduction to Ergonomics	5/125	15	30					1	1	78
43	HEL28712E1-LS	Introduction to Philosophy	5/125	15	30					2	2	76
44	BUA31308E2-LP	Job Analysis Methods	5/125	15		30				1	1	78
45	HEL30709E1-LS	Philosophy and the History of Ideas	5/125	30	15					1	1	78
46	BUA31408E2-LP	Principles of Contemporary Management	5/125	15		15				1	1	93
47	SOS10912E2-LS	Principles of Economics	5/125	15	30					1	1	78
48	HEL28912E1-LS	Sociology	5/125	15	30					1	1	78

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at the Session of the Faculty Council
Day/ Month/ Year
Chairman of the Faculty Council — Zurab Tsveraidze