Контрольный экземпляр 44. 4.1.ур.

Rector
Belarusian State University
_____ Andrei D. Karol
«22» 04 2019 г.
Registration number 531a-113/ур.

BELARUSIAN STATE UNIVERSITY

CURRICULUM

Speciality: 1-31 80 09 Applied Mathematics and Computer Science
Profiling: Computer Data Analysis

Degree: Master
Period of study: 1 year 8 months

I. Schedule of the educational process

II. Summary (in weeks)

YEARS	September					October				November				December				January				February				March				April				May				June				July				August				Academic Studies	Exams	Internship	Research	Master's Thesis	Vacation	Total
	1	8	15	22	29/09	6	13	20	27/10	3	10	17	24	1	8	15	22	29/12	5	12	19	26/01	2	9	16	23/02	2	9	16	23	30/03	6	13	20	27/04	4	11	18	25	1	8	15	22	29/06	6	13	20	27/07	3	10	17	24							
	7	14	21	28	05/10	12	19	26	02/11	9	16	23	30	7	14	21	28	04/01	11	18	25	01/02	8	15	22	01/03	8	15	22	29	05/04	12	19	26	03/05	10	17	24	31	7	14	21	28	05/07	12	19	26	02/08	9	16	23	31							
I																		=	=																																			36	6				10	52
II																		x	x	x	x	/	/	/	/	/	/	/	/	/	/	/	/	//																				13	3	4	12	1	2	35
																																																				49	9	4	12	1	12	87

Legend: [ ] — Academic Studies; [X] — Internship; [//] — Master's Thesis; [:] — Exams; [/] — Research; [=] — Vacation

III. Curriculum

No	The name of the module, academic discipline, course project (course work)	Exams	End-of-term test	Academic hours						Semesters												Totl credits	Competence Code
						As follows:				I year						II year							
										1 semester, 18 weeks			2 semester, 18 weeks			3 semester, 13 weeks			4 semester,				
				Total	Total in class	Lectures	Laboratory work	Workshops	Seminar classes	Total	Total in class	Credits	Total	Total in class .	Credits	Total	Total in class	Credits	Total	Total in class .	Credits		
1	*State Component*			**1358**	**340**	**140**	**140**		**60**	**686**	**240**	**21**	**384**	**100**	**12**	**90**		**3**	**198**		**6**	**42**	
1.1	**Module «Applied Mathematics Methods and Software »**			400	150	60	60		30	202	90	6	198	60	6							12	
1.1.1	Mathematical Modeling and Optimization of Complex Systems			96	40	20	20			96	40	3										3	UC -1, DPC -1, 2
1.1.2	Multivariate Statistical Analysis			106	50	20	20		10	106	50	3										3	UC -2, DPC -1, 3
1.1.3	Mathematical and Computer Forecasting			198	60	20	20		20				198	60	6							6	UC -3, DPC -1
1.2	**Module «Algorithmic Aspects of Computer Science»**			294	100	40	40		20	198	60	6	96	40	3							9	
1.2.1	Special Structures of Data	1		198	60	20	20		20	198	60	6										6	UC -4, DPC -4
1.2.2	Computational Geometry and Geometric Modeling	2		96	40	20	20						96	40	3							3	UC -1, DPC -4
1.3	**Module «Software Engineering»**			196	90	40	40		10	196	90	6										6	
1.3.1	Data Analysis Software	1		90	40	20	20			90	40	3										3	UC -3, 4, DPC -5
1.3.2	Data Processing Technologies and Computer Systems	1		106	50	20	20		10	106	50	3										3	UC -5, DPC -5
1.4	**Module «Research»**			468						90		3	90		3	90		3	198		6	15	
1.4.1	Research Seminar		1,2, 3,4	468						90		3	90		3	90		3	198		6	15	UC -1
2	*Higher Education Institution Component*			**1992**	**680**	**300**	**80**	**220**	**80**	**378**	**120**	**9**	**750**	**260**	**18**	**864**	**300**	**27**				**54**	
2.1	**Module «Specific Methods of Analysis in Applied Problems»**			504	160	80	80			252	80	6	252	80	6							12	
2.1.1	Visualization Methods in Big Data Analysis Using R		1	126	40	20	20			126	40	3										3	UC -5, SC -1
2.1.2	Fundamentals of Effective Computing Using GPU		2	126	40	20	20						126	40	3							3	UC -5, SC -2
2.1.3	Computer Vision		1	126	40	20	20			126	40	3										3	UC -5, SC -3
2.1.4	Queueing Systems Analysis and Optimization		2	126	40	20	20						126	40	3							3	UC -5, SC -4
2.2	**Module «Models, Methods and Algorithms of Machine Learning»**			378	120	60		60		126	40	3	252	80	6							9	
2.2.1	Methods and Algorithms of Machine Learning	2	1	252	80	40		40		126	40	3	126	40	3							6	SC -5 – 7
2.2.2	Neural Networks in Machine Learning		2	126	40	20		20					126	40	3							3	SC -5, 6, 8
2.3	**Module «Visualization and Intelligent Analysis»**			216	80	40		40					126	40	3	90	40	3				6	
2.3.1	Visual Analytics of Time-Oriented Data		2	126	40	20		20					126	40	3							3	SC -9 – 11
2.3.2	Intelligent Data Analysis		3	90	40	20		20								90	40	3				3	SC -9,10, 12, 13
2.4	**Module «Mathematical Methods in Data Analysis»**			396	120	40		40	40							396	120	12				12	
2.4.1	**For choice (2 of 4)**	3,3		396	120	40		40	40							396	120	12				12	
2.4.1.1	Sequential Statistical Analysis and Monitoring of Data Flows	3		198	60	20		20	20							198	60	6				6	SC -14, SC -15
2.4.1.2	Investment and Insurance Decisions Risk Management	3		198	60	20		20	20							198	60	6				6	SC -14, SC -16
2.4.1.3	Computational Methods in Data Analysis	3		198	60	20		20	20							198	60	6				6	SC -14, SC -17
2.4.1.4	Statistical Modeling and Analysis of Data in Economics and Finance	3		198	60	20		20	20							198	60	6				6	SC -14, SC -18
2.5	**Module «Complex Data Analysis »**			318	120	40		40	40				120	60	3	198	60	6				9	
2.5.1	Methods for Statistical Analysis of Complex Data	2		120	60	20		20	20				120	60	3							3	DPC -4, SC -19, SC -20

No	The name of the module, academic discipline, course project (course work)	Exams	End-of-term test	Academic hours						Semesters												Totl credits	Competence Code
						As follows:				I year						II year							
										1 semester, 18 weeks			2 semester, 18 weeks			3 semester, 13 weeks			4 semester,				
				Total	Total in class	Lectures	Laboratory work	Workshops	Seminar classes	Total	Total in class	Credits	Total	Total in class .	Credits	Total	Total in class	Credits	Total	Total in class .	Credits		
2.5.2	**For choice (1 of 2)**	3		198	60	20		20	20							198	60	6				6	
2.5.2.1	Data Mining Methods	3		198	60	20		20	20							198	60	6				6	DPC -4, SC -21
2.5.2.2	Applied Analysis of Signals	3		198	60	20		20	20							198	60	6				6	DPC -4, SC -22
2.6	**Module «Data Analysis in Applications»**			180	80	40		40								180	80	6				6	
2.6.1	**For choice (2 of 5)**		3,3	180	80	40		40								180	80	6				6	
2.6.1.1	Financial Market Analysis		3	90	40	20		20								90	40	3				3	DPC -5, SC -23
2.6.1.2	Internet-Data Analysis		3	90	40	20		20								90	40	3				3	DPC -5, SC -24
2.6.1.3	Panel Data Analysis		3	90	40	20		20								90	40	3				3	DPC -5, SC -23
2.6.1.4	Statistical Analysis of Incomplete Data		3	90	40	20		20								90	40	3				3	DPC -5, SC -24
2.6.1.5	Software Security and Protection		3	90	40	20		20								90	40	3				3	DPC -5, SC -25
3	***Optional subjects***			**/108**	**/56**	**/30**		**/26**								**/108**	**/56**	**/3**				**/3**	
3.1	Creative Education Techniques in Higher School / Pedagogy and Psychology of Higher Education		/3	*/108*	*/56*	*/30*		*/26*								*/108*	*/56*	*/3*				*/3*	UC-7
4	***Series of disciplines for candidate exams and additional training*** [1]			**/568**	**/316**	**/96**	**/36**	**/140**	**/44**	**/358**	**/202**	**/6**	**/210**	**/114**	**/9**							**/15**	
4.1	Philosophy and Methodology of Science	/2		*/240*	*/104*	*/60*			*/44*	*/140*	/60		*/100*	*/44*	*/6*							/6	UC-8
4.2	Information Technologies: Fundamentals		/1	*/108*	*/72*	*/36*	*/36*			*/108*	*/72*	*/3*										/3	UC-9
4.3	Foreign Language/ Foreign Language in Professional Activities	/2	/1	*/220*	*/140*			*/140*		*/110*	*/70*	*/3*	*/110*	*/70*	*/3*							/6	UC-6,10
Number of hours				**3350**	**1020**	**440**	**220**	**220**	**140**	**1064**	**360**	**30**	**1134**	**360**	**30**	**954**	**300**	**30**	**198**		**6**	**96**	
Number of hours per week										20			20			23							
Number of course works																							
Number of course projects																							
Number of exams				11/2						4			4/2			3							
Number of end-of-term tests				15/3						5/2			5			4/1			1				

IV. Internship				V. Research			VI. Final Certification
Internship Title	Semester	Weeks	Credits	Semester	Weeks	Credits	Master's Thesis
Research	4	4	6	4	12	18	

VII. Competence matrix

Competence Code	Competence name	Module Code, Discipline Code
UC-1	To be able to apply scientific cognition methods (analysis, comparison, systematization, abstraction, modeling, data authenticity checking, decision-making etc.) in independent research activity, to generate and realize innovative ideas	1.1.1, 1.2.2, 1.4.1
UC-2	To be able to formulate a solution based on the analysis of complex causal relationships	1.1.2
UC-3	To be able to apply interdisciplinary scientific knowledge for the formulation and solution of applied problems	1.1.3, 1.3.1
UC-4	To have the ability to design and use abstract models and structures	1.2.1, 1.3.1
UC-5	To have the ability to study in short periods and professionally exploit software systems, modules and libraries	1.3.2, 2.1.1, 2.1.2, 2.1.3, 2.1.4
UC-6	To use special foreign language vocabulary and terminology in professional activities	4.3
UC-7	To be able to perform teaching activity in education establishments, study and implement efficient education, information and communication technologies and pedagogic innovations	3.1
UC-8	To know the methodology of scientific cognition, to be able to analyse and evaluate the content and level of philosophic and methodological issue while solving the tasks related to research and innovative activity	4.1
UC-9	To have skills of using the contemporary information technologies for solving scientific research and innovative tasks	4.2
UC-10	To use a foreign language for communication in interdisciplinary and scientific environment, in various formats of international cooperation, research and innovative activity	4.3
DPC-1	To be able to apply system and comparative analysis for the construction of mathematical models of increased complexity	1.1.1, 1.1.2, 1.1.3
DPC-2	To have skills of computer implementation of methods for modeling and optimization of complex systems	1.1.1
DPC-3	To have skills to solve applied problems of multivariate data analysis using free modern statistical analysis software	1.1.2
DPC-4	To evaluate the performance of algorithms for solving applied problems	1.2.1, 1.2.2, 2.5.1, 2.5.2.1, 2.5.2.2
DPC-5	To master perspective programming technologies	1.3.1, 1.3.2, 2.6.1.1, 2.6.1.2, 2.6.1.3, 2.6.1.4, 2.6.1.5
SC-1	To have skills of using major visualization methods in R for big data	2.1.1
SC-2	To understand principles of effective computations using GPU and their using skills	2.1.2
SC-3	To have knowledge of most popular probabilistic models and mathematical methods used in computer vision, and to have experience in their software implementation	2.1.3
SC-4	To be able to choose the relevant queueing system to model a real situation, to make its analysis and optimization with respect to parameters	2.1.4
SC-5	To know principal concepts, mathematical models, methods, and algorithms of machine learning	2.2.1, 2.2.2
SC-6	To have experience in machine learning realization for solving of real data problems	2.2.1, 2.2.2
SC-7	To know advantages and disadvantages of the modern machine learning methods	2.2.1
SC-8	To master mathematical fundamentals of artificial neural network construction	2.2.2

Competence Code	Competence name	Module Code, Discipline Code
SC-9	To know modern approaches for visual analytics of time oriented data, and for intelligent data analysis	2.3.1, 2.3.2
SC-10	To have experience in software implementation of visual analytics methods for dynamic data and also of typical procedures of intelligent data analysis	2.3.1, 2.3.2
SC-11	To be able to perform visual analytics of real dynamic data	2.3.1
SC-12	To have knowledge of probabilistic models and methods of intelligent data analysis	2.3.2
SC-13	To have experience of decision making on the basis of the intelligent analysis of real data, of their accuracy and performance evaluation	2.3.2
SC-14	To master mathematical methods of data analysis that are used for solving of modern applied problems	2.4.1.1, 2.4.1.2, 2.4.1.3, 2.4.1.4
SC-15	To be able to construct the mathematical setting of the data flows monitoring problem, to choose a family of sequential tests to be used, and to evaluate their performance	2.4.1.1
SC-16	To have experience of performance analysis for investment and insurance decisions	2.4.1.2
SC-17	To know methods for computational performance increasing in solving of data analysis problems	2.4.1.3
SC-18	To be able to apply the known data models and statistical methods in economics and finance, and to modify them	2.4.1.4
SC-19	To have knowledge on modern probabilistic models that are used for complex data analysis	2.5.1
SC-20	To apply special modern methods for complex data analysis	2.5.1
SC-21	To master standard statistical methods for finding and analysis of dependencies in real data	2.5.2.2
SC-22	To have skills of applied analysis of signals	2.5.2.2
SC-23	To master modern approaches, models and methods for data analysis in financial markets and in longitudinal group econometric studies	2.6.1.1, 2.6.1.3
SC-24	To know principal features of methods used for the Internet data analysis and for incomplete data analysis	2.6.1.2, 2.6.1.4
SC-25	To have knowledge of major principles realized in providing security and protection of software	2.6.1.5

[1] Series of Disciplines for Candidate Exams and Additional Training «Philosophy and Methodology of Science», «Foreign Language», «Information Technologies: Basics» are studied according to the choice of a student.

AGREED
Vice-Rector
for Academic Affairs and Education Innovations
_____ Olga I. Chupris
«11» 04. 2019

AGREED
Academic Affairs Department,
Head
_____ Alena A. Dastanka
«11» 04 2019

AGREED
Vice Dean of the Faculty
of Applied Mathematics and Computer Science
_____ Tatsiana V. Soboleva
«11» 04. 2019