Rector
Belarusian State University
Andrei D. Karol
«__» _____ 2019 г.
Registration number 231a-112/уч.

MINISTRY OF EDUCATION OF THE REPUBLIC OF BELARUS

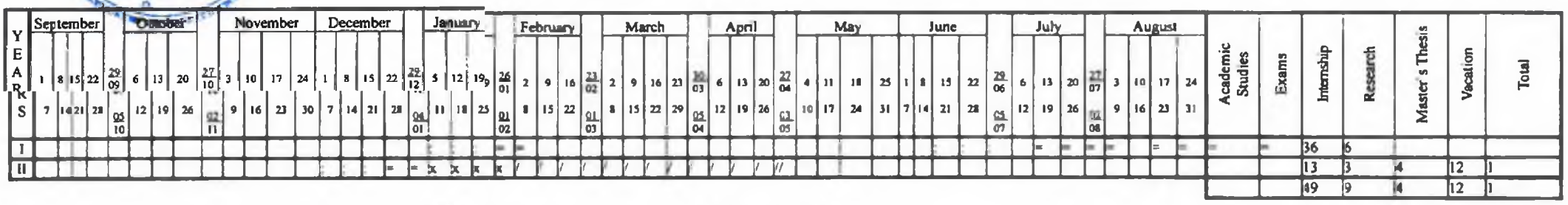
Контрольный экземпляр 41.61

CURRICULUM

Speciality: 1-31 80 09 Applied Mathematics and Computer Science
Profiling: Logistics analytics

Degree: Master
Period of study: 1 year 8 months

I. Schedule of the educational process



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

II. Summary (in weeks)

III. Curriculum

No	The name of the module, academic discipline, course project (course work)	Exams	End-of-term test	Academic hours: Total	Total in class	As follows: Lectures	Laboratory work	Workshops	Seminar classes	Semesters: I year, 1 semester, 18 weeks: Total	Total in class	Credits	I year, 2 semester, 18 weeks: Total	Total in class.	Credits	II year, 3 semester, 13 weeks: Total	Total in class	Credits	II year, 4 semester,: Total	Total in class.	Credits	Totl credits	Competence Code
1	*State Component*			1358	340	140	140		60	686	240	21	384	100	12	90		3	198		6	42	
1.1	**Module «Methods and software environment of applied mathematics»**			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 prediction			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 data structures	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	Technologies and data processing computer systems	1		106	50	20	20		10	106	50	3										3	UC -5, DPC -5
1.4	**Module «Academic 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 « Data management systems »**			504	160	80	80			252	80	6	252	80	6							12	
2.1.1	Resource planning and management		1	126	40	20	20			126	40	3										3	UC -5, SC -1, SC -5
2.1.2	Intellectual control systems		2	126	40	20	20						126	40	3							3	UC -5, SC -2, SC -5
2.1.3	Inventory management computer systems		1	126	40	20	20			126	40	3										3	UC -5, SC -3, SC -5
2.1.4	Data storage and processing computer technology		2	126	40	20	20						126	40	3							3	UC -5, SC -4, SC -5
2.2	**Module « Models and methods for solving logistics problems »**			378	120	60		60		126	40	3	252	80	6							9	
2.2.1	Models and methods for solving optimization problems of logistics	2	1	252	80	40		40		126	40	3	126	40	3							6	SC -6, SC -8
2.2.2	Heuristic methods for logistics problems		2	126	40	20		20					126	40	3							3	SC -7, SC -8
2.3	**Module «Visualization in logistics»**			216	80	40		40					126	40	3	90	40	3				6	
2.3.1	Business process visualization		2	126	40	20		20					126	40	3							3	SC -9, SC -11
2.3.2	Visualization methods in logistics		3	90	40	20		20								90	40	3				3	SC -10, SC -11
2.4	**Module «Data analysis in logistics»**			396	120	40		40	40							396	120	12				12	
2.4.1	**Disciplines by choice (2 disciplines of 4)**	3,3		396	120	40		40	40							396	120	12				12	
2.4.1.1	Intelligent data analysis	3		198	60	20		20	20							198	60	6				6	SC -12, SC -15
2.4.1.2	Methods of digital transformation of business processes	3		198	60	20		20	20							198	60	6				6	SC -13, SC -15, SC -22
2.4.1.3	Models and methods for constructing digital twins in analytical logistics	3		198	60	20		20	20							198	60	6				6	SC -8, SC -13, SC -15
2.4.1.4	Information Search	3		198	60	20		20	20							198	60	6				6	SC -14, SC -15
2.5	**Module «Routing and schedules in logistics»**			318	120	40		40	40				120	60	3	198	60	6				9	
2.5.1	Routing tasks in logistics	2		120	60	20		20	20				120	60	3							3	DPC -4, SC -16, SC -19
2.5.2	**Disciplines by choice (1 disciplines**	3		198	60	20		20	20							198	60	6				6	

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 (analysis, comparison, systematization, abstraction, modelling, 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 production problems	1.1.3, 1.3.1
UC-4	Have the ability to design and use abstract models and structures	1.2.1, 1.3.1
UC-5	Have the ability to study in the shortest time 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 vocabulary and terminology in a foreign language in professional activities	4.3
UC-7	To be able to perform pedagogical activity in education establishments, master and implement efficient education and information and communication technologies and pedagogical innovations.	3.1
UC-8	To master 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 scientific 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, scientific 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	Have the skills of computer implementation of methods for modeling and optimization of complex systems	1.1.1
DPC-3	Have the skills to solve applied problems of analyzing multidimensional data using free available modern software in the field of statistical analysis	1.1.2
DPC-4	Evaluate the effectiveness 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 advanced 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 master various levels of production planning and control, material requirements planning, production technology concepts, theory of constraints and performance evaluation	2.1.1.
SC-2	To master concepts and be able to apply ERP-systems to describe and implement business processes of the enterprise, to conceive the relationship between production, accounting, planning in the enterprise	2.1.2
SC-3	Be able to identify, analyze and solve inventory management problems using quantitative models and algorithms	2.1.3
SC-4	To master theoretical knowledge of the concepts of data storage on remote resources, be able to use methods of processing such data	2.1.4
SC-5	To be able to use enterprise resource planning systems, understand the interrelationships of system modules with real enterprise processes and the data flow in an enterprise resource planning system, to master existing methods of solving the task of searching, recognizing and processing data	2.1.1,2.1.2, 2.1.3, 2.1.4
SC-6	To be able to classify logistics tasks, formulate mathematical models and define optimization goals, solve problems using applied software and analyze solution results	2.2.1
SC-7	To know and be able to apply existing heuristic methods to solve logistic problems, to master ways to implement heuristic algorithms in modern programming languages	2.2.2

No	The name of the module, academic discipline, course project (course work)	Exams	End-of-term test	Academic hours						Semesters												Totl credits	Competence Code
				Total	Total in class	As follows:				I year						II year							
										1 semester, 18 weeks			2 semester, 18 weeks			3 semester, 13 weeks			4 semester,				
						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		
	of 2)																						
2.5.2.1	Scheduling theory and its applications	3		198	60	20		20	20							198	60	6				6	DPC -4, SC -17, SC -19
2.5.2.2	Algorithms for solving problems in conditions of uncertainty	3		198	60	20		20	20							198	60	6				6	DPC -4, SC -18, SC -19
2.6	**Module «Applied informatics in logistics»**			180	80	40		40								180	80	6				6	
2.6.1	**Disciplines by choice (2 disciplines of 5)**		3,3	180	80	40		40								180	80	6				6	
2.6.1.1	The use of GIS in logistics		3	90	40	20		20								90	40	3				3	DPC -5, SC -20, SC -25
2.6.1.2	Robotic systems		3	90	40	20		20								90	40	3				3	DPC -5, SC -21, SC -25
2.6.1.3	Evaluation of business processes efficiency		3	90	40	20		20								90	40	3				3	DPC -5, SC -22, CK-25
2.6.1.4	Algorithms of planning in oil and gas logistics		3	90	40	20		20								90	40	3				3	DPC -5, SC -23, SC -25
2.6.1.5	Combinatorial models and algorithms		3	90	40	20		20								90	40	3				3	SC -24, SC -25
3	***Optional subjects***			**/108**	**/56**	**/30**		**/26**								**/108**	**/56**	**/3**				**/3**	
3.1	Creative teaching techniques in higher school / Pedagogics 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]																						
4.1	Philosophy and methodology of science			**/568**	**/316**	**/96**	**/36**	**/140**	**/44**	**/358**	**/202**	**/6**	**/210**	**/114**	**/9**							**/15**	
4.2	Information technologies: basics	/2		*/240*	*/104*	*/60*			*/44*	*/140*	/60		*/100*	*/44*	*/6*							/6	UC-8
4.3	Foreign language/ Foreign language in professional activities		/1	*/108*	*/72*	*/36*	*/36*			*/108*	*/72*	*/3*										/3	UK-9
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				

Competence Code	Competence name	Module Code, Discipline Code
SC-8	To know typical optimization problems of logistics, to master models and algorithms for solving, to be able to create modern efficient algorithms for problems of large dimensionality	2.2.1, 2.2.2, 2.4.1.3
SC-9	To know and be able to use tools to describe and visualize logistic processes in a company.	2.3.1.
SC-10	To master and be able to apply the concepts of collecting, preparing and visualizing data in logistics, modern data visualization tools, and being able to select software tools for specific use cases	2.3.2
SC-11	To master and be able to use software products for data visualization within the framework of the enterprise's logistic processes	2.3.1, 2.3.2
SC-12	To be able to use modern methodological support in the field of data mining, to know the algorithms and the area of their use in data analysis problems	2.4.1.1
SC-13	To understand the basics of digital transformation methodology, be able to develop and apply methods and tools for digital transformation of economic, logistic, social, government and technical systems	2.4.1.2, 2.4.1.3
SC-14	To be able to implement the various components of information search systems and analyze the data resulting from the interaction of information search systems with the user	2.4.1.4
SC-15	To master existing methods and algorithms (including intellectual ones) of solving problems of search, recognition and data processing in logistics	2.4.1.1, 2.4.1.2, 2.4.1.3, 2.4.1.4
SC-16	To master the classification of routing tasks in logistics, be able to apply models and algorithms to solve routing problems	2.5.1.
SC-17	To be able to set and solve problems of the theory of schedules in the application to the problems of logistics	2.5.2.1
SC-18	To have skills in solving logistic problems with uncertain parameters	2.5.2.2
SC-19	To master knowledge and practical experience in solving routing problems and scheduling theory in logistics	2.5.1, 2.5.2.1, 2.5.2.2
SC-20	To know and be able to use geoinformation systems for solving logistical tasks, be able to implement geoinformation systems using modern programming languages	2.6.1.1
SC-21	To master the concepts, schemes and algorithms of the functioning of robotic systems, to know and be able to apply robotic systems in the tasks of industrial and transport logistics	2.6.1.2
SC-22	To be able to evaluate the activity of an enterprise on the basis of financial data about its work, to know ways to identify non-optimal business processes, to be able to restructure them in order to increase efficiency	2.6.1.3
SC-23	To master planning algorithms for solving logistics problems in the oil and gas complex.	2.6.1.4
SC-24	To have the skills to use combinatorial models for logistics problems, to know the algorithms for solving combinatorial problems in logistics.	2.6.1.5
SC-25	To use modern scientific and technical achievements of applied informatics in the field of developing efficient algorithms for solving logistics problems	2.6.1.1, 2.6.1.2, 2.6.1.3, 2.6.1.4, 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