Контрольный экземпляр

45.6.21 уп.

APPROVED

Rector

_____ Andrei D. Karol

«22» 03 2022.

Registration number № G 31а-18.1уп/

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BELARUSIAN STATE UNIVERSITY

CURRICULUM

for foreign students

Speciality: 1-31 80 20 Applied physics

Profiling: Photonics

Degree: Master

Period of studies: 1 year 8 months

Form of education: full-time (day-time)

I. Schedule of the educational process

II. Summary data for time account (in weeks)

COURSES	September					October				November				December					January				February				March					April				May				June					July				August					Academic studies	Exams	Practical training	Master's thesis	Final attestation	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													18					:	:	:	=	=								17										:	:	:	:	=	=	=	=	=	=	=	=	35	7				10	52
II									14						:	=	=					8				:	X	X	X	X	/	/	/	/	//																	22	2	4	4	1	2	35
																																																						57	**9**	**4**	**4**	**1**	**12**	**87**

Legend: [ ] — academic studies [X] — practical training [//] — final attestation [:] — exams [/] — Master's thesis [=] — vacation

III. Curriculum

№№	Name of the modulus, academic discipline, course project (course work)	Exams	End-of-term tests	Academic hours						Years and semesters														Competence code
						Including				I year						II year								
										1 semester, 18 weeks			2 semester, 17 weeks			3 semester, 14 weeks			4 semester, 8 weeks				
				Total	Auditorium hours	Lectures	Laboratory works	Practical training	Seminars	Total	Auditorium hours	Credits	Total	Auditorium hours	Credits	Total	Auditorium hours	Credits	Total	Auditorium hours	Credits		
1.	**State component**			**1560**	**462**	**246**	**72**	**120**	**24**	**846**	**318**	**24**	**534**	**144**	**15**	**90**		**3**	**90**		**3**		
1.1.	*Module «Technological applications of theoretical physics»*																						
1.1.1	Condensed state physics	1		216	90	46		44		216	90	6											UC -1, 2 APC -1
1.1.2	Applied problems in thermodynamics and statistical physics	1		216	90	46		44		216	90	6											UC -1, 2 APC -2
1.1.3	Modern problems of physics	1		108	48	36			12	108	48	3											UC -1, 2 APC -3
1.1.4	Physics of energy and wave processes		2	108	48	36			12				108	48	3								UC -1, 2 APC-4
1.2.	*Module «Mathematical methods in physics»*																						
1.2.1	Mathematical modeling methods for physical processes	2	1	324	138	54	52	32		216	90	6	108	48	3								UC -3, APC -5
1.2.2	Computational methods in physics and physical experiment	2		108	48	28	20						108	48	3								UC -3, APC -6
1.3	*Module «Research activities associated with the subject of master's thesis»*																						UC -1-3
1.3.1	Research seminar		1,2,3,4	360						90		3	90		3	90		3	90		3		
1.3.2	Course work according to the subject-matter of master's thesis			120									120		3								
2.	**Higher educational institution component**			**2168**	**834**	**430**	**224**		**180**	**216**	**90**	**6**	**600**	**240**	**15**	**866**	**324**	**27**	**486**	**180**	**15**		
2.1	*Module «Physical optics»*[1]																						
2.1.1	Physical optics	1		108	44	32			12	108	44	3											SC -1
2.1.2	Laser physics		1	108	46	34			12	108	46	3											SC -2
2.1.3	Specialized laboratory works «Laser physics»	2		120	48		48						120	48	3								SC -2
2.1.4	Theory and technique of spectroscopy	2		240	96	52	32		12				240	96	6								SC -3
2.2	*Module «Crystal physics»*																						
2.2.1	Crystallography		2	120	48	36			12				120	48	3								SC-4
2.2.2	Semiconductor physics	2		120	48	36			12				120	48	3								SC -5
2.3	*Module «Methods of material science»*[1]																						
2.3.1	Physics of nondestructive testing of the material structure	3		198	72	48			24							198	72	6					SC -6
2.3.2	Specialized laboratory works «Nondestructive testing of the material structure»		3	198	72		72									198	72	6					SC -6
2.3.3	Semiconductor optics	3		94	36	24			12							94	36	3					SC -7
2.3.4	Laser spectroscopy and diagnostics of materials		3	94	36	24			12							94	36	3					SC -7

№№	Name of the modulus, academic discipline, course project (course work)	Exams	End-of-term tests	Academic hours						Years and semesters												Competence code
						Including				I year						II year						
										1 semester, 18 weeks			2 semester, 17 weeks			3 semester, 14 weeks			4 semester, 8 weeks			
				Total	Auditorium hours	Lectures	Laboratory works	Practical training	Seminars	Total	Auditorium hours	Credits	Total	Auditorium hours	Credits	Total	Auditorium hours	Credits	Total	Auditorium hours	Credits	
2.3.5	Specialized laboratory works «Laser and optical spectroscopy»		3	94	36		36									94	36	3				SC -7
2.4	*Module «Optoelectronics*[1]																					
2.4.1	Optoelectronics		3	94	36	24			12							94	36	3				SC -8
2.4.2	Laser systems		3	94	36	24			12							94	36	3				SC -8
2.5	*Module «Applied photonics»*[1]																					SC -9
2.5.1	Laser processing of materials	4		96	36	24			12										96	36	3	
2.5.2	Fiber lasers and optics	4		96	36	24			12										96	36	3	
2.5.3	Metamaterials		4	96	36	24			12										96	36	3	
2.5.4	Nonlinear optical media		4	96	36	24			12										96	36	3	
2.5.5	Specialized laboratory works « Nonlinear optical media »		4	102	36		36												102	36	3	
3.	**Optional disciplines**																					
3.1	Technologies of creative education in higher school / Pedagogy and psychology of higher education		/3	/108	/56	/30		/26								/108	/56	/3				UC-4
4.	**Additional training**																					
4.1	Philosophy and methodology of science [2]	/2		/240	/104	/60			/44	/140	/60		/100	/44	/6							UC5
4.2	Foreign language[2]/ Russian for international communication	/2	/1	/220	/140			/140		/110	/70	/3	/110	/70	/3							UC-6
4.3	Basics of information technologies[2]		/1	/108	/72	/36	/36			/108	/72	/3										UC-7

Hours of studies	3728	1296	676	296	120	204	1062	408	30	1134	384	30	956	324	30	576	180	18	
Hours of studies per week							23			23			23			23			
Number of course works	1									1									
Number of exams	13						4			5			2			2			
Number of end-of-term tests	16						3			3			6			4			

IV. Practical training				V. Master's thesis			VI. Final attestation
Name of ractical training	Semester	Weeks	Credits	Semester	Weeks	Credits	Defense of master's thesis
Research internship	4	4	6	4	4	6	

VII. Competence matrix

Competence code	Competence	Modulus, educational discipline code
UC-1	Abilities to use the scientific cognition techniques (analysis, comparison, systematization, abstracting, modeling, data verification, decision-making, etc.) in independent research activities, to generate and to realize innovative ideas	1.1.1-1.1.4, 1.3
UC-2	Abilities to solve practical problems using the knowledge acquired in theoretical physics; to realize the professional research and technological activities; to comprehend creatively scientific, engineering, and design information; to analyze the process of solving scientific and technological problems	1.1.1-1.1.4, 1.3
UC-3	Ability to use the fundamental mathematical knowledge to analyze, verify, and estimate completeness of information in the process of professional activities; if required, to find and synthesize insufficient information; to realize the activities in conditions of uncertainty	1.2.1, 1.2.2, 1.3
UC-4	Ability to realize pedagogical activities in educational institutions; to master and introduce the effective educational and information-communication technologies, pedagogical innovations	3.1
UC-5	Mastering of the scientific cognition techniques; ability to analyze and to estimate the content and level of philosophical-methodological problems when accomplishing the tasks of research and innovative activities	4.1
UC-6	Mastering of foreign languages for communication in interdisciplinary and research fields, in different forms of international collaboration, research and innovative activities	4.2
UC-7	Skills to use advanced information technologies for solving of research and innovative problems	4.3
APC-1	Ability to use the methods of theoretical physics for description of condensed media, to apply the accumulated knowledge in independent developmental work, to extend the competence and skills to new fields of modern technologies	1.1.1
APC-2	Abilities to analyze and professionally use the modern methods of thermodynamics and statistical physics; to perform analytical and numerical calculations, to use the obtained results for the creation of new technological products and technologies	1.1.2
APC-3	Ability to use the achievements in modern physics for solving of applied problems; skills of using the theoretical techniques to analyze behavior of nonlinear dynamic systems	1.1.3
APC-4	Ability to use the approaches of vibration and wave theory for description of real systems and of the energy processes in them	1.1.4
APC-5	Ability to construct and develop mathematical models for physical phenomena, to realize them with the use of modern information technologies; to analyze the proposed product in context of the latest achievements of mathematical modeling	1.2.1
APC -6	Ability to understand and apply professionally the computational experiment techniques; to perform efficient numerical calculations within the scope of models for description of physical objects and processes	1.2.2
SC -1	Ability to use the basic laws and concepts of the interaction of optical radiation with matter, the laws of wave and ray optics, the problem solving methods and the techniques for experimental studies of optical systems	2.1.1
SC -2	Ability to demonstrate and understand the physical processes of lasing in various systems	2.1.2, 2.1.3
SC -3	Ability to use the understanding of a quantum nature of optical phenomena for analysis of atomic and molecular spectra, for the development of innovative spectroscopic devices	2.1.4

Continue of curriculum of the specialty 1-31 80 20 «Applied physics», registration number Б 31а-187 уд.

Competence code	Competence	Modulus, educational discipline code
SC -4	Ability to use in research and design activities the knowledge of crystallographic laws, crystal-lattice symmetry, types and mechanisms associated with atomic and ionic bonds in a crystal lattice, of effects exerted by the crystal-lattice defects on the properties of materials	2.2.1
SC -5	Ability to explain and to predict the electrophysical properties of semiconductors proceeding from their band structure	2.2.2
SC -6	Ability to study the structure and phase composition of materials, to perform diagnostics of materials using the nondestructive testing methods, to apply the obtained results in the process of engineering and technological activities	2.3.1, 2.3.2
SC-7	Ability to conduct spectroscopic studies, to examine the optical, optoelectronic properties of semiconductors and of other materials, to use the obtained results for the development of innovative devices and equipment	2.3.3, 2.3.4, 2.3.5
SC -8	Ability to use in research activities the knowledge of the structure, operation principles of modern optical, electronic devices and systems	2.4.1, 2.4.2
SC -9	Ability to apply data about the structure, optical properties of materials and systems, about the interaction of laser radiation with matter to the development of innovative devices and equipment	2.5.1 – 2.5.5

Developed on the basis of the standard curriculum approved 21.03.2019 (registration number № G 31-2-012/ пр.-тип.)

[1] List of the moduli and disciplines at the student's choice is annually revised and corrected by the Faculty Council according to the proposals from the relevant departments and personnel recruiting organizations.

[2] The general-education disciplines «Philosophy and methodology of science», «Foreign language», «Principles of information technologies» are at the choice of a student studying for the Master's Degree. The final attestation for the general-education disciplines «Philosophy and methodology of science» and «Foreign language» is in the form of the candidate's exam, for the general-education discipline «Principles of information technologies» – in the form of candidate's test.

AGREED
Vice-Rector
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Education Innovations
Alesia G. Prakharenka
«22» 03 2022

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Recommended for approval by the Scientific and Methodological Council of
Belarusian State University
Record dated 18.03.2022 г. № 4