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Report on the Development and Testing of new curricula

April 12 – 13, 2018,

Minsk

Improvement of master level education in the field of physical sciences in Belarusian universities (PHYSICS)

561525-EPP-1-2015-1-LV- EPPKA2-CBHE-JP

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Description of the courses

- General data
- Course outline
- Learning outcomes with the methods of assessment
- Structure of the study subject

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BSU 11 courses

- Composite nanostructured materials 5-year course 2
- Nanomaterials in energetics 5-year course 2
- Physics and Chemistry of Surface 2.5
- Optics of nanostructures 2
- Thermodynamics of nanosystems 2
- Opto- and microelectronics 2
- Physics of electri-cally conductive polimers 5-year course 2
- Nanotechnologies in electronics 5-year course 2
- Spintronics 5-year course 2
- Physics and Chemistry of Surface 5-year course 2
- Laser Physics 2.5
- Nanophotonics master 2.5

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During the project implementation BSU team has developed the following presentations for lecture courses:

- Composite nanostructured materials (9 presentations)
- Physics and Chemistry of Surface (14 presentations)
- Spintronics (3 presentations)
- Introduction to Soilid State Physics (12 presentations)

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GrSU (1),

- Nanophotonics 4

- All materials are posted on the educational portal at https://edu.grsu.by/

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GoSU (9)

- Sol-gel synthesis of functional materials 4
- Modulators of a laser radiation 4
- Industrial lasers 4
- Metamaterials 4
- Physics of wave processes 4
- Ellipsometry 4
- The modern ideas of matter structure 3
- Computer simulation 3
- Quantum theory of atomic and molecular spectra 4

The report contains no information about the methodological materials

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BSTU (4)

- Functional Nanomaterials 1
- Promising technologies for processing polymers and composites 3
- Theoretical basis of polymer processing 4
- Modification of polymers and composites 1

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During the project implementation BSTU team has developed the following presentations for lecture courses

- **Functional nanomaterials** (lecture notes for specialty 1-48 80 04)

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New curricular testing

- BSU 11 courses
- GrSU (1)
- GoSU (9)
- BSTU (4)

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BSU - Belarusian State University

111 questionnaire forms have been proceeded

111 questionnaire forms were found valid

Course title	Degree of course (bachelor, master)	Testing results				
		Strongly disagree %	Partially disagree %	Neutral assessment %	Partially agree %	Strongly agree %
Composite nanostructured materials	5-year course	3,64	1,82	7,27	29,09	54,75
Nanomaterials in energetics	5-year course	0	1,82	10,90	14,55	72,73
Physics and Chemistry of Surface	bachelor	1,07	4,23	14.44	29,41	50.85
Opto- and microelectronics (Labs)	1-year master	9,09	0	9,09	0,18	82,64
Physics of electrically conductive polymers	5-year course	0	0	0	0	100
Spintronics	5-year course	0	0	2,27	9,09	88,64
Laser Physics	4-year course	0,91	0	2,73	15,45	80,91
Optoelectronics	4-year course	1,82	2,73	9,09	12,73	73,64
Coherent optics and Holography	5-year course	2,80	0	1,40	19,58	76,23
Fiber Optics	5-year course	0	0	6,29	13,28	80,42
Nanophotonics	5-year course	0	0	2,10	23,07	73,43
Opto- and microelectronics	5-year course	0	0	0	24,55	75,45

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BSU - Belarusian State University

- Most of the students noted the topical and interesting materials, their well structured character. The dialogue way of the classes as well as number of the practical tasks that provides better mastering of the subject.
- The necessity of the practical tasks and labs was specially marked by the students as a demand for better mastering of material.

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GrSU, Grodno State University

Evaluation from Students

- 8 questionnaire forms have been proceeded
- 8 questionnaire forms were found valid

Statistics on the answers given on the course (in percentage).

Course Name of course	**Degree of course**	**Testing results**				
		Strongly disagree %	**Partially disagree %**	**Neutral assessment %**	**Partially agree %**	**Strongly agree %**
Nanophotonics	**Master**	**0**	**0**	**0**	**7,5**	**92,5**

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GoSU, Gomel State University

- 60 questionnaire forms have been proceeded
- 60 questionnaire forms were found valid

Statistics on the answers given on the course (in percentage).

Course Name of course	Degree of course	Testing results				
		Strongly disagree %	Partially disagree %	Neutral assessment %	Partially agree %	Strongly agree %
The modern ideas of matter structure	1-year master	0	0	4.7	36	59.3
Computer simulation	1-year master	0	0	4	42.7	53.3
The modern ideas of matter structure	2-year master	0	0	0	30	70
Computer simulation	2-year master	0	0	0	33	67
Quantum theory of atomic and molecular spectra	2-year master	0	0	0	21.8	78.8

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Comments and conclusions about testing results at Go SU

- Most master students noted that the lectures were interesting and relevant. Modern teaching methods were used: presentations, video. Some of them admitted friendly atmosphere during the lecture courses
- A large amount of information was received on the subjects studied and mastered the skills to work with modern software for physical processes simulation as well.
- Most mater students noted the necessity for getting more audio and video materials to increase the efficiency of self-study

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BSTU, Belarusian State Technological University

- 4 questionnaire forms have been proceeded
- 4 questionnaire forms were found valid

Statistics on the answers given for the course (in percentage)

Course Name of course	Degree of course	Testing results				
		Strongly disagree %	Partially disagree %	Neutral assessment %	Partially agree %	Strongly agree %
Functional Nanomaterials	1-year master	0	0		25	75
Promising technologies for processing polymers and composites	1-year master	0	0	0	25	75
Modification of polymers and composites	1-year master	0	0	25	25	50

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Comments and conclusions about testing results at BSTU

- Most master students noted that the lecture materials were interesting and relevant. Modern facilities for studying were used: presentations, video information. For the discipline "Functional nanomaterials" it was noted the possibility of using materials based on the Moodle platform
- Received a fairly large amount of information on the studied subjects. Received information about nanomaterials, methods of their synthesis and properties and nanotechnologies. Received skills in the use of nanomaterials to modify the properties of polymers, as well as information on the effect of basic types of nanomaterials on the processing of polymers
- Some master students noted the need to increase audio and video materials to increase the effectiveness of independent study of the material

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Feed-back from academic/teacher staff involved in teaching of students by subjects

Students had very different levels of basic training. They received different specialties for 4 years of study: physicist engineer (1 person), electronics engineer (4 persons), energy engineer (3 persons). One student was expelled before the end of the course. Despite the heterogeneity of basic training, students were interested in the new course with concern and this allowed to reach the general average level

Novelty

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Spring semester

- BSTU - Theoretical basis of polymer processing
- GrSU - 1.Optical methods of investigations

  2.Physical-chemical methods of analysis (new master program «Modern methods and equipment of physical measurements»)
- GoSU - Physics of wave processes (4)
- BSU – 8 - 5

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THANK YOU!

Questions? Comments?