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# Improvement of master-level education in the field of physical sciences in Belarusian universities

**Implementation of courses, teaching materials and study programs and their accreditation**

**Testing of the courses, teaching materials and study programs**

# Reminding of the WP2 tasks for Belarusian consortium

- ***Preparation of e-Books "FNM" and "Photonics"***;
- ***Development/modernizing and accreditation of new muster-level curricula*** for Belarusian universities;
- ***Development/modernizing and internal* validation *of study programs for courses*** in Belarusian universities;
- ***Development/modernizing of didactic materials for courses*** in Belarusian universities;
- ***Testing of developed/modernized courses and teaching (didactic) materials***

# Current status

**1. The testing of the developed/modernised courses in the 1st semester is completed.**

**2. Guides for laboratory practices are completed for testing**

**3. Lecture synopsises, presentations and other didactic materials are completed for using**

**4. Curricula and study programs were reviewed by Associated Partners (BPS, RANI, RSI for Nuclear Problems of BSU, Private Belarus-Japan Enterprise LOTIS-TII)**

**5. Arrangement of the developed/modernized courses and laboratory practices testing in the 2nd semester**

- **9 developed/modernised courses/labs were tested testing in BSU during the 1st semester of 2017-2018 educational year**
- **8 developed/modernised courses/labs are tested in BSU during the 2nd semester of 2017-2018 educational year**

# Validated Study Programs (Examples)

Белорусский государственный университет

УТВЕРЖДАЮ

Проректор по учебной работе

А.Л. Толстик

Регистрационный № УД-

КОМПОЗИЦИОННЫЕ НАНОСТРУКТУРИРОВАННЫЕ МАТЕРИАЛЫ

Учебная программа учреждения высшего образования по учебной дисциплине для специальности 1-31 04 07 Физика наноматериалов и нанотехнологий

Минск 2017

Белорусский государственный университет

УТВЕРЖДАЮ

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Регистрационный № УД-

НАНОМАТЕРИАЛЫ В ЭНЕРГЕТИКЕ

Учебная программа учреждения высшего образования по учебной дисциплине для специальности 1-31 04 07 Физика наноматериалов и нанотехнологий

Минск 2017

Белорусский государственный университет

УТВЕРЖДАЮ

Проректор по учебной работе

А.Л.Толстик

2016 г.

Регистрационный № УД-2933 /уч.

ТЕРМОДИНАМИКА НАНОСИСТЕМ

Учебная программа учреждения высшего образования по учебной дисциплине для специальности 1-31 04 07 Физика наноматериалов и нанотехнологий

Минск 2016

# Developed/modernized courses tested during the Autumn semester of the 1st testing year

| Univer-sity | Course Title | Updated or totally newly created | Level | ECTS credit points | Teaching/ training methodolo-gies | The link to the university'webpage | Type of control (set-off, exam) | The status of recognition/ accreditation |
|---|---|---|---|---|---|---|---|---|
| **BSU** | **Composite nanostructured materials** | **totally new** | **1-year/ 2-year masters/ 5-year course** | **2,0** | **Lecture** | https://dl.bsu.by/mod/folder/view.php?id=30554 | exam | University validation |
| **BSU** | **Nanomaterials in energetics** | **totally new** | **1-year/ 2-year masters/ 5-year course** | **2,0** | **Lecture** | https://dl.bsu.by/mod/folder/view.php?id=30554 | set-off | University validation |
| **BSU** | **Optics of nanostructures** | **Updated** | **2-year masters/ Bachelor** | **2,0** | **Lecture** | https://dl.bsu.by/mod/folder/view.php?id=30554 | Set-off | University validation |
| **BSU** | **Thermodynamics of nanosystems** | **totally new** | **2-year masters/ 5-year course** | **2,0** | **Lecture** | https://dl.bsu.by/mod/folder/view.php?id=30554 | Set-off | University validation |

# Developed/modernized courses tested during the Autumn semester of the 1st testing year

| Univer-sity | Course Title | Updated or totally newly created | Level | ECTS credit points | Teaching/ training methodolo-gies | The link to the university'webpage | Type of control (set-off, exam) | The status of recognition/ accreditation |
|---|---|---|---|---|---|---|---|---|
| **BSU** | **Opto- and microelectronics** | **Updated** | **2-year master** | **2,0** | **Lecture** | https://dl.bsu.by/mod/folder/view.php?id=30554 | exam | University validation |
| **BSU** | **Opto- and microelectronics** | **Updated** | **1-year master** | **2,0** | **Labs** | https://dl.bsu.by/mod/folder/view.php?id=30554 | Set-off | University validation |
| **BSU** | **Physics of electrically conductive polymers** | **Updated** | **5-year course** | **2,0** | **Lecture** | https://dl.bsu.by/mod/folder/view.php?id=30554 | set-off | University validation |
| **BSU** | **Nanotechnologies in electronics** | **totally new** | **2-year masters/ 5-year course** | **2,0** | **Lecture** | https://dl.bsu.by/mod/folder/view.php?id=30554 | exam | University validation |
| **BSU** | **Spintronics** | **totally new** | **2-year masters/ 5-year course** | **2,0** | **Lecture** | https://dl.bsu.by/mod/folder/view.php?id=30554 | set-off | University validation |
| **BSU** | **Physics and Chemistry of Surface** | **Updated** | **2-year masters/ 5-year course/ Bachelor** | **2,5** | **Lecture** | https://dl.bsu.by/mod/folder/view.php?id=30555 | exam | University validation |

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BSU

## Developed/modernized courses tested during the Autumn semester of the 1st testing year

| Univer-sity | Course Title | Updated or totally newly created | Level | ECTS credit points | Teaching/ training methodolo-gies | The link to the university'webpage | Type of control (set-off, exam) | The status of recognition/ accreditation |
|---|---|---|---|---|---|---|---|---|
| BSU | Introduction to Soilid State Physics | totally new | 5-year course/ Bachelor | 3 | Lecture | https://dl.bsu.by/mod/folder/view.php?id=30555 | exam | University validation |
| BSU | Laser Physics | Updated | 5-year course/ Bachelor | 2,5 | Lecture | https://dl.bsu.by/mod/folder/view.php?id=30555 | exam | University validation |
| BSU | Nonlinear Optics | Updated | 5-year course/ Bachelor | 2,5 | Lecture | https://dl.bsu.by/mod/folder/view.php?id=30555 | exam | University validation |
| BSU | Optoelectronics | Updated | 5-year course/ Bachelor | 3 | Lecture | https://dl.bsu.by/mod/folder/view.php?id=30555 | set-off | University validation |
| BSU | Coherent Optics and Holography | Updated | 2-year masters/ 5-year course | 3 | Lecture | https://dl.bsu.by/mod/folder/view.php?id=30555 | exam | University validation |
| BSU | Fiber Optics | Updated | 2-year masters/ 5-year course | 2 | Lecture | https://dl.bsu.by/mod/folder/view.php?id=30555 | set-off | University validation |
| BSU | Nanophotonics | Updated | 5-year course | 3 | Lecture | https://dl.bsu.by/mod/folder/view.php?id=30555 | exam | University validation |

**Curricula and study programs were reviewed by Experts of Associated Partners (BPS, RANI, RSI for Nuclear Problems of BSU, Private Belarus-Japan Enterprise LOTIS-TII)**

**4. Curricula and study programs were reviewed by Experts of Associated Partners (BPS, RANI, RSI for Nuclear Problems of BSU, Private Belarus-Japan Enterprise LOTIS-TII)**

**Since 01.02.2018 to 01.03.2018, within the framework of the PHYSICS project, the BSU conducted a survey of experts on the quality of preparation of curricula and some courses/laboratory study programs for testing in the 2017-2018 educational year.**

**4. Curricula and study programs were reviewed by Experts of Associated Partners (BPS, RANI, RSI for Nuclear Problems of BSU, Private Belarus-Japan Enterprise LOTIS-TII)**

**For the reviews, two types of questionnaires were proposed:**

- **a curricula questionnaire and**
- **a questionnaire for the evaluation of courses and/or laboratory study programs.**

**4. Curricula and study programs were reviewed by Experts of Associated Partners (BPS, RANI, RSI for Nuclear Problems of BSU, Private Belarus-Japan Enterprise LOTIS-TII)**

**Each type of questionnaires includes two types of questions:**

- **One type of questions included information about experts (age, position, professional experience in education, science and industry, gender, etc.).**
- **The second list of questions included information concerning the expert's opinion on the quality of either curricula or study programs and suggestions for their improving.**

**4. Curricula and study programs were reviewed by Experts of Associated Partners (BPS, RANI, RSI for Nuclear Problems of BSU, Private Belarus-Japan Enterprise LOTIS-TII)**

**Each curricula was approved by the Ministry of Education of the Republic of Belarus:**

**1. Master's degree program 81 03 Functional nanomaterials_2 years**

**2. Master's degree program Physics of Nanomaterials and Nanotechnologies_1 year**

**3. Master's degree program 81 02 Photonics_2 of the year 2017**

**4. Master's degree program 1-31_81_02 Photonics_1 year 2012**

## 4. Curricula and study programs were reviewed by Experts of Associated Partners (BPS, RANI, RSI for Nuclear Problems of BSU, Private Belarus-Japan Enterprise LOTIS-TII)

**A total of 9 experts were interviewed, according to the specialization profile of the curricula and programs:**

- **4 from RANI (mainly the laboratories of the Research Scientific Institutes of the National Academy of Sciences of Belarus and the heads of the departments/laboratories of Belarusian universities),**
- **3 from the BPO (the management of the BFO Presidium),**
- **2 from RSI NP of BSU (Deputy Director and Leading Scientific Researcher) and**
- **1 of LOTIS-TII PE (leading engineer for production of high-tech devices).**

**4. Curricula and study programs were reviewed by Experts of Associated Partners (BPS, RANI, RSI for Nuclear Problems of BSU, Private Belarus-Japan Enterprise LOTIS-TII)**

**The questionnaires, together with the approved curricula and (or) study programs, were sent to experts by e-mail and the answers from them were received in the form of scans, and then by mail.**

# 4. Curricula and study programs were reviewed by Experts of Associated Partners (BPS, RANI, RSI for Nuclear Problems of BSU, Private Belarus-Japan Enterprise LOTIS-TII)

**Preliminary conclusions:**

1. 100% of the survey participants have approved the need for the transition of higher education in Belarus to the Bologna 4 + 2 system, which is confirmed by the statistics of answers to questions and explanatory notes to some questions.

2. 100% of the survey participants have approved the need for the introduction of training programs in the specialties "Functional nanomaterials", "Photonics", "Nanomaterials and nanotechnologies".

3. Approximately 90% of the experts interviewed have confirmed the importance of the introduced courses and laboratory works, although the programs themselves have certain comments that will be used for their tuning.

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# Thank you for attention

# **Questions?**

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