FINAL REPORT

On project QUALITY

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1. The purpose of the Final Report

The Final Report on Quality is prepared for the assessment of a results achieved by the Project "Improvement of master level education in the field of physical sciences in Belarusian universities (PHYSICS)".
This Final Report is the ultimate summary on the quality of conformed and compatible/unified curricula and development of study programs at four Belarusian universities, hereinafter called Higher education institution (HEI), namely:

- Belarusian State University (BSU);
- Grodno State University (GrSU);
- Gomel State University (GoSU);
- Belarusian State Technological University (BSTU).

The Final Report on Quality is based on the Final Report on Project Quality, received from partners' universities. Final Report on Project Quality includes:

- Review and summary on Deliverable No 2.1. "Report on new curricular testing with feedback from stakeholders";
- Review and Summary on Deliverable No 2.2. "Development of conformed and compatible/unified curricula".

The Final Report was received from the Project Management team who submitted also additional documents related to the project and its results.

2. Review and summary of the Deliverables

According to the goal and schedule of the Project, Log Frame Matrix (LFM), ENQA guidelines and other relevant educational requirements, the Universities' working groups submitted two main deliverables:

- Deliverable No 2.1. "Report on new curricular testing with feedback from stakeholders" and
- Deliverable No 2.2. "Development of conformed and compatible/unified curricula.

External reviewer for assessing the quality of the project results has used the following additional documents:

- Results on the Questionnaire for staff;
- Results and summary of the training evaluation sheet for students;
- Report on study courses and internship testing.

2.1 Deliverable No 2.1. "Report on new curricular testing with feedback from stakeholders"

As Performance Measurement Indicators the following two main parameters were used:

A. Description and the number of validated / tested during one-year master-level courses.

B. Feed-back from main stakeholders (student feed-back testing; feed-back from academic/teacher staff - teacher's questionnaire; feed-back from student's governance).

Summary of the Performance Indicators

During the 2017/2018 study year the following results were achieved.

A. Description and the number of validated / tested during one-year master-level courses.

BSU:

- **11** study courses and **3** laboratory practices were tested during the 2017/2018 study year;
- **7** study courses and **1** laboratory practices will be tested during the 2018/2019 study year;

BSTU:

- 4 study courses were tested during the 2017/2018 study year;

GrSU:

- 3 study courses were tested during the 2017/2018 study year;

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GoSU: 4 study courses were tested during the 2017/2018 study year.

B. Feed-back from main stakeholders

According to the Requirements of the PROJECT and Log-Frame Matrix the partner HEI have gathered the feed-back from main stakeholders which includes: student feed-back, feed-back from academic/teacher staff - teacher's and feed-back from student's governance.

BSU:

- Feed-back from **142** students;
- Feed-back from **14** teachers;
- Feed-back from representatives of the student's governance: **2** feed-back reports and **2** statistic forms.

BSTU:

- Feedback from student organizations about 4 study courses.

GrSU:

- Feedback from student organizations about 3 study courses;
- Student attraction events: "Open doors", excursion to the enterprise "Center for Standardization and Metrology", "Physics days" and international conference for students, master and PhD students "Physics of condensed matter".

GoSU:

- Feed-back from 60 students;
- Students attraction events.

2.2 Deliverable No 2.2. "Development of conformed and compatible/unified curricula

According to the Requirements of the PROJECT and Log-Frame Matrix the partner HEI had provided outputs and have submitted the clear evidence on related project achievements. Mentioned evidence consists of the following components:

A. The number of teaching materials developed: lecture notes/synopsises, descriptions/manuals of laboratory works, courses books, etc.;

B. The number and names of Standard master-level programs with ECTS system' application, accredited in the Ministry of Education;

B1. The number and names of education courses with ECTS system' application, accredited in the partner's university;

C. The number of study programs for master-level courses descriptions;

D. The number of teaching/didactic materials uploaded to e-Library; Virtual laboratory for student training, the instruction for its on-line usage.

Summary of conformed and compatible/unified curricula

A. The number of teaching materials developed: lecture notes/synopsises, descriptions/manuals of laboratory works, courses books, etc.;

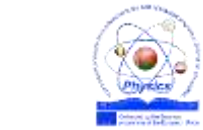
B. The number and names of Standard master-level programs with ECTS system' application, accredited in the Ministry of Education;

B1. The number and names of education courses with ECTS system' application, accredited in the partner's university;

C. The number of study programs for master-level courses descriptions.

Title of HEI	The names of the developed courses and programs
Belarusian State University (BSU)	***The number and titles of Standard master-level, bachelor and 5-year specialists' programs with ECTS system' application, accredited in the Ministry of Education*** 1-31_81_02-Photonics for 4-5-year courses 2012 1-31_81_03-Functional nanomaterials for 4-5-year courses 2012 Curricula_81 02 Photonics_2 year master level 2017 Curricula _81 03 Functional nanomaterials_2 year master level 2017 **In total four (4) Standard master-level, bachelor and 5-year specialists' programs with ECTS system' application were developed and tested.**
	The number and titles of study courses and labs with ECTS system' application, accredited in the BSU - Master and 5-year course "Composite nanostructured materials" - Master and 5-year course "Nanomaterials in energetics" - 5-year and Bachelor study course "Physics and Chemistry of Surface" - 1-year and 2-year master "Opto- and microelectronics" - Bachelor study course "Thermodynamics of nanosystems" - Master and 5-year study course "Opto- and microelectronics" * - 5-year study course "Physics of electrically conductive polymers" - 5-year study course "Nanotechnologies in electronics" - 5-year study course "Spintronics" - 5-year course "Physics and Chemistry of Surface" - Bachelor course "Physics and Chemistry of Surface" - Master and 5-year study course "Laser Physics" - Master and 5-year course "Photovoltaics"

	- Master and 5-year labs "Photovoltaics" - Master and 5-year course "Physics of Condensed Matter" - Master and 5-year course "Nonlinear optics" - 2-year Master-level course "Physics of Surface and Methods of their Diagnostics" - 2-year Master-level and 5-year course "Introduction to Solid State Physics" - Bachelor and 5-year labs "Semiconducting devices" - Bachelor and 5-year labs "Integrated environment for engineer computation-labs" **In total twenty-two (22) study courses and labs with ECTS system' application, accredited in the BSU were developed.**
	The number and titles of teaching/didactic materials 1. Composite nanostructured materials (9 presentations); 2. Physics and Chemistry of Surface (14 presentations); 3. Spintronics (3 presentations); 4. Introduction to Soiled State Physics (12 presentations) 5. Semiconducting devices (descriptions of 2 labs by scanning probe microscopy and short description of AFM 6. Course Works and Diploma supported by the project **In total thirty-six (36) presentations, two (2) labs, Course Work and Diploma were developed.**
Grodno State University	***The number and names of Standard master-level programs with ECTS system' application, accredited in the Ministry of Education*** 1-31_81-04-2012-1 **In total one (1) Standard master-level programme with ECTS system' application was developed and tested**
	Description of the courses/ education programs Master course description "Nanophotonics" (NPs) Master course description Physical and chemical methods of analysis (PCMA) Master course description Optical methods of investigations (OMI) **In total three (3) study courses with ECTS system' application,**



	accredited in the GSU were developed.
Belarusian State Technological University (BSTU)	***The number and names of Standard master-level programs with ECTS system' application, accredited in the Ministry of Education*** 1-48 80 04 – "Technology and processing of polymers and composites" **In total one (1) Standard master-level programme with ECTS system' application was developed and tested**
	Description of the courses/ education programs Master Course description "Functional nanomaterials" Master Course description "Promising technologies for processing polymers and composites" Master Course description "Theoretical basis of polymer processing" Master Course description "Modification of polymers and composites" **In total four (4) study courses with ECTS system' application, accredited in the BSTU were developed.**
Gomel State University (GoSU)	***The number and names of Standard master-level programs with ECTS system' application, accredited in the Ministry of Education*** 1-31 80 05 Physics 1 year 1-31 80 05 Physics 2 year **In total two (2) Standard master-level programmes with ECTS system' application were developed and tested**
	Description of the courses/ education programs Master Course description "Sol-gel synthesis of functional materials" Master Course description "Physics of wave processes" Master Course description "Modulators of a laser radiation" Master Course description "Industrial laser" Master Course description "Metamaterials" Master Course description "Ellipsometry" Master Course description "The modern ideas of matter structure"

	Master Course description "Computer simulation" Master Course description "Quantum theory of atomic and molecular spectra" **In total nine (9) study courses with ECTS system' application, accredited in the GoSU were developed.**

D. The number of teaching/didactic materials uploaded to e-Library; Virtual laboratory for student training, the instruction for its on-line usage.

Title of HEI	**Teaching/didactic materials in e-Library, virtual laboratory, instructions for on-line usage**
Belarusian State University (BSU)	https://dl.bsu.by/mod/folder/view.php?id=30904 https://dl.bsu.by/mod/folder/view.php? id=30905 https://dl.bsu.by/mod/folder/view.php?id=38503) **In total three (3) various sets of teaching materials in BSU e-Library were developed and uploaded.**
Grodno State University	Teaching materials: https://edu.grsu.by Training journal: Intranet: intra.grsu.by **In total one (1) set of teaching materials and one (1) training journal in GSU e-Library were developed and uploaded.**
Belarusian State Technological University (BSTU)	Teaching materials: https://dl.bsu.by/mod/folder/view.php?id=30904 Other materials for "Technology and processing of polymers and composites" specialty students: https://dl.bsu.by/mod/folder/view.php?id=36491 **In total two (2) various sets of teaching and supplementary materials in BSTU e-Library were developed and uploaded.**
Gomel State University (GoSU)	Teaching materials: https://dl.bsu.by/mod/folder/view.php?id=30905 https://dl.bsu.by/mod/folder/view.php?id=30904 https://dl.bsu.by/mod/folder/view.php?id=30905

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	In total three (3) various sets of teaching materials in GoSU e-Library were developed and uploaded.

3. Assessment of the Quality control of the project management

According to the goal and schedule of the Project, Log Frame Matrix (LFM), ENQA guidelines and other relevant educational requirements, and for ensuring the high Quality of the Project' Deliverables, the Project management team has developed and followed the approved Plan with milestones.

Progress control was carried out the Working Package level by measuring the appropriate resources and costs, by performing the following activities:

- Progress control;
- Cost control;
- Checking schedules and milestones;
- Quality assessment of deliverables;
- Risk management and problem issues solution.

Below the main outcomes from the partners' HEI are outlined.

Title of HEI	Main activities and outcomes on Project Management Quality
Belarusian State University (BSU)	1. The quality of the project implementation was based on the elaborated "Project Manual" (PM) and full compatibility between the Workplan and the approached results. 2. Exchange of experiences for improving the quality of education in Belarusian universities were also based on knowledge dissemination through management meetings, workshops, national and international conferences, placing the results of the project in the RTU WEB-portal and on Moodle Platform in BSU (https://dl.bsu.by/). 3. Quality control and monitoring were based on the management procedures included: – constant participation of BSU manager in Management meetings and Workshops planned; – the improvement of quality of the teaching/learning process based on the use of the experience of the EU partner universities in the applying of innovative educational technologies;

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	– transfer of this information to other partners from Belarusian consortium through the internal management meetings; – regular consultations and advices with the project coordinator in Riga. 4. BSU has played the role of a senior partner in relation to other universities of Belarusian consortium (GrSU, GGU and BSTU), helping the other Belarusian Universities teams to make consultations by different issue and organizing/controlling the implementation of the Workplan. 5. For controlling and managing the quality of the project implementation, BSU team and other Belarusian partner HEI were subjected to 2 special monitoring procedures (in 2016 and 2017). 6. The reporting documents by the mentioned activities were uploaded on the BSU Moodle Platform. 7. It is worth mentioning the specific approach to the Risk management of the project. For the avoidance of the risks fail to execute the Workplan BSU and other partner HEI have used the closeness of the training programs for the students of physical faculties learning by specialties “Physics” and “Nanomaterials and nanotechnologies” for the system (5 + 1) and by specialties of “Functional nanomaterial” and “Photonics” for the future system (4 + 2). Such an approach has allowed to minimize the consequences of deviation from the project objectives in view of the real state of affairs in the Belarusian higher education system. 8. For more sophisticated testing of study materials in 2016/2017 study year some of the materials developed in e-books "Functional nanomaterials" and "Photonics" have been already used by students of the 4th and 5th year studying in the framework of a 5-year program for specialists, as well as master-students with a one-year cycle of learning.
Grodno State University	1. There is a quality control system in GSU within the management system. 2. The Quality Working Group was having a work plan and holds regular meetings and Quality control of the educational process was carried out by this working group. 3. Control of attending classes, timetables and other matters are carried out by the training department. 4. The timely placement of study materials on the University's educational portal was monitored by the training department.

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	5. Monitoring of project implementation was carried out by the International Activities Department on regular basis. Twice a year the project manager submitted the Report on the progress of the project. 6. The financial costs were controlled by the representative of the Accounting department. 7. The members of the working group monitored the surveys and summarized the results of the survey of undergraduates and teachers on the new training courses in 2018. 8. Risk management and problem issues solution is carried out at the interaction with the university Top Management.
Belarusian State Technological University (BSTU)	1. As part of monitoring the progress of project implementation, the meetings of the working group were regularly organized. Additionally, the overall coordination of the implementation of the project was carried out by International Relations Office. 2. The financing of the project, purchases and costs were controlled and managed by the financial department of the university. 3. The curricula, developed and modernized within the framework of the project, were reviewed by representatives of outside organizations: educational institutions and industrial enterprises.
Gomel State University (GoSU)	1. The monitoring on the timely implementation of all phases of the project were organized on regular basis and done by the Project Managers. 2. Internal meetings were held for managing the progress of the project. 3. The timetable and list of costs, for ex., equipment, business trips, salary payments, etc. was monitored on regular basis.

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4. Project Quality Assessment results

External reviewer has carried out the assessment of the Project Quality according to the set of evaluation criteria listed below. For each of the evaluation criteria, the following assessment scale is applied:

- not achieved
- partly achieved
- largely achieved
- fully achieved
- not applicable in this stage of the Project

Criteria/Guiding questions	Assessment	Observations and comments
Involvement of the stakeholders 4.1. Have all relevant stakeholders been involved in the process of development and implementation?	Fully achieved	The involvement of all relevant stakeholders definitely can improve quality of the Project results. Main groups of the stakeholders were noticeably involved in the project. The reviewer clearly sees the evidence of the stakeholders' contribution to the Project deliverables. So, academic/teaching staff, students and students' organizations were asked to submit the feed-back about the project' outcomes.
4.2. Have the comments from the different stakeholder groups (teachers, students, students' organizations) been taken into consideration?	Fully achieved	The comments and recommendations of the stakeholders' groups expressed during their feed-back was taken into consideration for the improvement of the project outcomes. See. P. 3.
4.3. Have other stakeholder groups (alumni, employers) been involved?	Not applicable in this stage of the Project	Issue for further development at the later stages
Sustainability of the Quality Control and Management System 4.4. Whether there exists	Fully achieved	There is established and working procedures and / or system of constant monitoring the quality of the study programs and study courses in each partner HEI involved in the Project. The

mechanism of continuing and long-term control and management of study programs and study courses quality?		reviewer clearly sees the evidence of such procedures/system existence.
4.5. Does the Project anticipate continuation of Quality testing and maintenance?	Fully achieved	The number of developed study courses, study materials, labs and other educational documents will be tested during next time period.
4.6. Does the partner HEI have a Quality Management Policy in place?	Not applicable in this stage of the Project	Issue for further development at the later stages
Infrastructure, on-line equipment, e-Library, virtual laboratory 4.7. Is the infrastructure, on-line equipment, e-Library and virtual laboratory appropriate for achieving the academic and professional learning outcomes of the project?	Fully achieved	Sets of Teaching materials, Training journals and other relevant information are uploaded to the partner HEI Portals and e-Library.
4.8. Whether each partner HEI ensures the access to relevant teaching/didactic materials in on-line mode?	Fully achieved	The students and teachers of each partner HEI have full access to the teaching/didactic materials in on-line mode.

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5. Conclusions and Further Development

Conclusions about Project Quality and Recommendations for further development.

5.1. The Quality of the Project is completely acceptable and corresponds to the Project' requirements, Log Frame Matrix, ENQA guidelines and other relevant educational requirements

5.2. All relevant stakeholders have been involved to the assessment of the Project' outcomes at the current development stage. However, the reviewer would recommend in future consider the possibility of involving two new groups of stakeholders, namely alumni of the developed study programs and representatives of the employers. These two additional stakeholders can play serious role in assessment and further successful evolution of the programs.

5.3. The reviewer would recommend establishing a Quality Management Policy at each partner HEI. This Policy should be approved by the Top Management decision of each partner HEI, implemented and communicated to the each HEI community.

5.4. The general academic on-line infrastructure, e-Library, virtual labs are fully accessible by the students and teachers from all partner HEI.

The reviewer,

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