



# SUMMARY REPORT

on joint international accreditation  
of the educational programme

“Power Plant Engineering”

in the field of study

“Heat Power Engineering and  
Thermal Engineering” (13.04.01),

delivered by Peter the Great St. Petersburg Polytechnic  
University

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2017

While preparing this Summary Report we used information from the Self-Evaluation Report and the Report on the External Review of the educational programme "Power Plant Engineering" in the field of study "Heat Power Engineering and Thermal Engineering" (13.04.01), delivered by Peter the Great St. Petersburg Polytechnic University.

The presentation document for the use by the National Accreditation Board.

## CONTENTS

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General information on educational institution.....	4
Information on the educational programme undergoing accreditation.....	6
Achievements of the educational programme.....	8
External review panel.....	11
Compliance of the external review outcomes with the NCPA's standards.....	13
Distribution digram of the external review outcomes.....	18
Conclusion of the external review panel.....	19
Schedule of the site visit of the external review panel.....	20

## GENERAL INFORMATION ON EDUCATIONAL INSTITUTION

Full name of the educational institution	<i>Federal State Autonomous Educational Institution of Higher Education "Peter the Great St. Petersburg Polytechnic University"</i>
Founders	<i>Ministry of Education and Science of the Russian Federation</i>
Year of foundation	<i>1899 – St. Petersburg Polytechnic Institute 1910 – St. Petersburg Peter the Great Polytechnic Institute 1914 - Petrograd Peter the Great Polytechnic Institute 1922 – M.I. Kalinin First Petrograd Polytechnic Institute 1924 – M.I. Kalinin Leningrad Polytechnic Institute 1990 - Leningrad State Technical University 1992 – St. Petersburg State Technical University 2002 - State Educational Institution of Higher Professional Education "St. Petersburg State Polytechnic University" 2011 - Federal State Educational Institution of Higher Professional Education "St. Petersburg State Polytechnic University" 2014 - Federal State Autonomous Educational Institution of Higher Education "St. Petersburg State Polytechnic University" 2015 - Federal State Autonomous Educational Institution of Higher Education "Peter the Great St. Petersburg Polytechnic University"</i>
Location	<i>195251, 29 Polytechnicheskaya Str., St. Petersburg, Russian Federation</i>
Rector	<i>Doctor of Sciences, Professor, corresponding member of the Russian Academy of Sciences Andrey Rudskoy</i>
License	<i>Series 90L01 № 0008982, reg. № 1949 dated from 19.02.2016 permanent</i>
State Accreditation	<i>Series 90A01 № 0001921, reg. № 1828 of 7.04.2016 valid till 11.03.2019</i>

Number of students 29367

*among them:*

*Full-time 19795*

*On-site and off-site 2557*

*Part-time 7015*

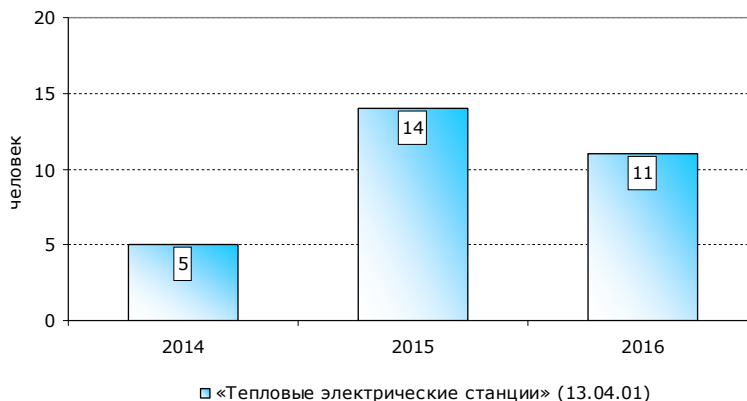
## INFORMATION ON THE EDUCATIONAL PROGRAMME UNDERGOING ACCREDITATION

Educational programmes	<i>"Power Plant Engineering" (13.04.01)</i>
Level of training / Standard period of training	<i>master's degree programme / 2 years</i>
Structural subdivisions (head)	<i>Institute of Energy and Transport Systems (Nikolai Zabelin, Candidate of Technical Sciences, Associate Professor)</i>
Major department (head of major departments)	<i>Department of "Nuclear and Heat Power Engineering" (Vitaly Sergeev, Doctor of Sciences, Professor)</i>
Date of the site visit	<i>April 11-12, 2017</i>
People responsible for public accreditation of the study programme	<i>Dmitry Arseniev, Professor Vice-Rector for International Relations  Alena Aleshina, Candidate of Engineering Sciences, Associate Professor of the Department "Nuclear and Heat Power Engineering"</i>

**ВЫБОРОЧНЫЕ РЕЗУЛЬТАТЫ ПРОЕКТА  
«ЛУЧШИЕ ОБРАЗОВАТЕЛЬНЫЕ ПРОГРАММЫ  
ИННОВАЦИОННОЙ РОССИИ»**

<b>Indicators</b>	2017
<b>The educational programme "Power Plant Engineering" (13.04.01)</b>	
Number of the given programmes in the RF	94
Number of higher educational institutions to offer the given programmes	94
Number of programmes – winners of the project (% from total amount of these programmes offered in the RF)	3 (3,2%)
<b>Saint Petersburg</b>	
Number of the given programmes offered in the region	9
Number of programmes – winners of the project (% from total amount of these programmes offered in the region)	1 (11,1%)
Number of higher educational institutions and branches in the region	96
Total number of programmes offered in the region	1606
Total number of programmes – winners of the project (% from total amount of these programmes offered in the region)	385 (24%)

**REFERENCE DATA ON STUDENT ENROLLMENT FOR PROGRAMMES**



## **ACHIEVEMENTS OF THE EDUCATIONAL PROGRAMME**

### **Quality of implementing the educational programme**

The quality of the study programmes is assured by the high level of qualification of the teaching staff: the leading teachers of SPbPU and partner HEIs from abroad are employed in the programme; the teachers participate in human resource development programmes, academic mobility programmes and in international research and practice conferences; the students are actively involved in research; there is a network of partner institutions involved in the international mobility of students; adequate resources are available for the quality implementation of the programme: classrooms, laboratories, libraries, etc.

### **Guaranteeing of up-to-date educational content**

The up-to-date educational content of the programme is provided through the annual labour market monitoring with the purpose of searching for new professions and spheres of work. The employers' requirements for graduates are regularly reviewed.

In order to make current the practical content of the programme some additional events are organized:

- leading foreign teachers are invited as guest lecturers (in 2016 there were 25 visiting lecturers in the Institute of Energy and Transport Systems);
- study visits to the companies of the North-Western Region (the South-Eastern TPP», Leningrad Nuclear Power Plant, Siemens Gas Turbines Technologies, JSC "REP Holding" and others.
- International Winter and Summer Schools for students are held, where they can acquire new knowledge and experience.

### **Staff composition (competency of the teaching staff)**

All the disciplines of the curriculum are delivered either by full-time teachers of SPbPU, or foreign teachers employed by SPbBU, or by practitioners working in the power complex of Saint Petersburg. The number of the teachers involved in the programme is sufficient for its successful implementation.

The teaching staff of the programme comprises 24 full-time teachers; out of this number 5 teachers are visiting lecturers from partner institutions. 75 % of the teachers have academic degrees of Candidate and Doctor of Sciences. The teachers without degrees employed in the programmes are practitioners with experience in the industry. All this ensures a high qualification level of the teaching staff.

### **Independent assessment of student learning outcomes**

According to RAEX (Expert PA) SPbPU is included in the top ten of the best technical higher education institutions of Russia.



## Educational resources

The programme has in place modern technical and material resources sufficient for the programme delivery. Classroom facilities comprise seven lecture rooms of the IE&TS with twenty-five seats each, two classrooms with thirty seats and two computer classrooms, one of the Nuclear and Heat Power Engineering Department and one of the Thermophysics of Power Units Department. Computer classrooms are equipped with all necessary licensed software and have fifteen seats.

The Fundamental Library of Polytechnic University is one of the largest scientific and technological libraries in Russia, and rates among the three best libraries in Saint Petersburg.

## Research activity

The teachers and students of the study programme are actively involved in research. They are doing research commissioned by municipal entities of the RF, Russian companies, and within the framework of the state order by the Ministry of Education of the RF. The research findings are published in the Russian leading scientific journals of Russia, and in the journals listed in the Web of Science Scopus data bases.

## Students' academic mobility

Academic mobility programmes are available to the students starting with the second or the third term of studies. The semester programmes of academic mobility to foreign Universities are supported by the federal programme of the Ministry of Education of the Russian Federation «5-100-2020», and international grant projects FIRST, DAAD и ERASMUS+. The academic mobility is implemented in four directions:

1. Germany: Technical University of Munich, Leibniz University of Hannover.
2. Finland: Lappeenranta University of Technology.
3. Italy: Politecnico di Milano.
4. Spain Polytechnic University of Valenci.


Every semester the University receives 6-10 foreign students from European countries within academic mobility programmes.

## Graduates' employability

The programme's graduates are employed according to their qualification or continue their studies in post graduate programmes.

## International projects

In 2015/2016 the teachers of the Department together with some colleagues from partner Universities applied for participation in Erasmus+ international project for facilitating international mobility of the staff and students. The applications were approved by the EC experts. In 2018 three teachers, two administrative staff



representatives, 5 undergraduate and post- graduate students are expected to go to Italy for one semester. Italian students and teachers are coming on exchange to SPbPU.

### Public information

Information about the programme is available at the University site, at the site of the Department of “Nuclear and Heat Power Engineering”; the information is also available at the international education exhibitions and portals.

## EXTERNAL REVIEW PANEL



**Prof. Dr. Dmitry Ivanov** (Moscow)

Review Chair, Russian expert

*PhD in Engineering Sciences, Head of Academic Affairs Office, Professor, General Physics and Nuclear Fusion Department, Thermal and Atomic Power Engineering Institute, National Research University "Moscow Power Engineering Institute"*

nominated by the Guild of Experts in Higher Education



**Prof. Dr. Andrea Luke** (Kassel)

Deputy Review Chair, international expert

*PhD in Machine Engineering, Professor for Thermodynamics, Kassel University, Member of Directory of International Institute of Refrigeration Expertise, member of International Centre for Heat and Mass Transfer, member of German Association for Refrigeration and Climate Engineering, Editor of the Journal of Heat and Mass Transfer*

nominated by the Accreditation Agency EVALAG  
(Evaluationsagentur Baden-Württemberg)

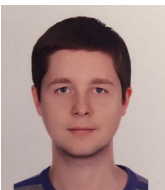


**Dipl.-Ing. Martina Pösl** (Munich)

Panel member, representative of professional community, international expert

*Qualified Engineer for power plants, Allianz Risk Consulting employee (Munich)*

nominated by the Accreditation Agency EVALAG  
(Evaluationsagentur Baden-Württemberg)



**Aleksey Korniliev** (Saint-Petersburg)

Panel member, representative of student community, Russian expert

*Postgraduate student of the 3d year, Department for Refrigeration Technology and Renewable Energy, Saint Petersburg National Research University of Information Technologies, Mechanics and Optics*

nominated by Saint Petersburg National Research University  
of Information Technologies, Mechanics and Optics

## **INFORMATION ON THE LEADING TEACHERS OF THE EDUCATIONAL PROGRAMME**

### **Vitaly Sergeev**

*Head of the Department of Nuclear and Heat Power Engineering, Doctor of Sciences, Corresponding member of the Russian Academy of Sciences, member of the expert Council of Higher Attestation Commission of the Ministry of Education and Science of the Russian Federation for Power Engineering for Power Engineering, Electrical Engineering and Energy Mechanical Engineering, Expert of the National Accreditation Agency, member of the Academic Council, member of the Dissertation Board*

### **Konstantin Lebedev**

*Candidate of Engineering Sciences, Associate Professor of the Department of Turbines, Hydro Machines and Aircraft Engines*

### **Ekaterina Kitanina**

*Candidate of Engineering Sciences, Associate Professor of the Department of Thermophysics of Power Units, winner of the competition of young researchers of SPbPU*

### **Alena Aleshina**

*Candidate of Engineering Sciences, Associate Professor of the Department of Nuclear and Heat Power Engineering, winner of the competition of the Russian Academy of Sciences for the best student paper*

### **Natalia Agafonova**

*Candidate of Engineering Sciences, Associate Professor of the Department of Thermophysics of Power Units*

### **Irina Anikina**

*Candidate of Engineering Sciences, Assistant Lecturer of the Department of Nuclear and Heat Power Engineering*

### **Esa Vakkilainen**

*Doctor of Sciences, Professor of Lappeenranta University of Technology, visiting Professor at SPbPU*

### **Harald Schwarz**

*Doctor of Sciences, Professor of Brandenburg University of Technology, Cottbus, visiting Professor of SPbPU, member of the board the German Association of Engineers, member of CIGRE and other organizations*

### **Pietro Zunino**

*Doctor of Sciences, Professor of the University of Genova, visiting Professor of SPbPU, Scientific Researcher for several European research projects on Aerodynamics of Gas Turbines*

# COMPLIANCE OF THE EXTERNAL REVIEW OUTCOMES WITH THE NCPA'S STANDARDS

## STANDARD 1. Programme profile

Compliance with the standard: **substantial compliance (good)**

### Good practice

The study programme «Power Plant Engineering» takes an important place in the training of highly qualified personnel for the regional labour market in the sphere of design, operation and engineering of thermal power plants.

The programme is delivered in the English language and was a basis for opening a double degree programme with Lappeenranta University of Technology and a triple degree programme together with Lappeenranta University of Technology (Finland) and Leibniz University of Hannover(Germany).

The programme provides good opportunities for academic mobility in the second and third semester of studies.

The students participate in national and international conferences.

The relevance of the programme's goals and objectives is confirmed by high demand for the graduates on the labour market.

Availability of partnership agreements with foreign Universities ensures a high level of student mobility.

Visiting lecturers from leading Universities are employed at the programme.

### Areas for improvement:

The profile of the study programme should be sharpened and the learning outcomes should be described more precisely in the module handbook with a clear differentiation from other programmes within the institute. The same concerns the titles of all modules. They should be more concrete to better match the content of the single lectures and seminars.

Responsibilities, requirements and teachers' names should be clearly stated in the module handbook for all classes.

The study programme should be more actively promoted by the University with an increased international online visibility. Additionally, the visibility of the learning outcomes should be increased on the website of the university

## **STANDARD 2. Curriculum**

Compliance with the standard: **substantial compliance (good)**

### **Good practice**

The study programme provides for the building of professional competences necessary for highly qualified specialists in the sphere of design, assembly, and operation of electric power stations, which also give the graduates opportunities to work both in research and teaching and professional sphere.

There is a research module in the curriculum. The curriculum comprises different types of classes for effective acquisition of desired competences (lectures, practical classes, laboratory work, independent work).

The curriculum is annually reviewed, especially those disciplines which cover the professional areas of training. The review process takes into consideration the opinions of employers.

A considerable portion of the student work load consists of research into the subject areas of their profile.

### **Areas for improvement:**

A broader scope of fundamental courses, especially in thermodynamics, fluid-dynamics, heat-mass exchange, physics and mechanical engineering concepts should be integrated into the curriculum in order to fill knowledge gaps of students with different bachelor background learning experience.

There should be a greater transparency among teachers of classes taught by their colleagues and more interfaces, especially between visiting lecturers, because teachers from different universities do not have contact to each other within the learning process.

A Russian language course should be mandatory for international students in the first term.

An increased extent of obligatory experimental practical laboratory classes should be included into the curriculum for all students, and especially for students who do not have the opportunity to work in the industry.

Students should be given the opportunity to create an individual study plan.

It is necessary to extend the number of selective courses and enhance possibilities for students to choose these courses.

Additional voluntary advanced classes should be offered, especially for students pursuing an academic career.

### **STANDARD 3. Student assessment**

Compliance with the standard: **substantial compliance (good)**

#### **Good practice**

The local regulatory documents describing the system of formative and summative assessment are in place.

The themes of master theses are up-to-date.

Various forms of assessment are applicable to the students: exams with examination papers in oral and written form, control tests, individual and group presentations, tests with multiple choice questions and question/answer tests, case studies, oral presentations, course projects, course papers, etc.

The assessment forms for master students involve formative assessment, interim control and summative assessment (defense of graduation qualification thesis).

The assessment of students is performed by the University teachers (75% are academic degree holders) and by practitioners having experience of work in the industry.

#### **Areas for improvement:**

The visibility of the examination system and assessment criteria should be expanded and the attestation as well as assessment regulations should be made available for international students in the English language.

A clear responsibility for the methodology of 5-point assessment and its compliance with the ECTS assessment system should be designated.

### **STANDARD 4. Organisation of the study programme**

Compliance with the standard: **substantial compliance (good)**

#### **Good practice**

Entry requirements for the study programme are a Bachelor's degree diploma in a relevant area (Energy Technology, Mechanical Engineering, Power Engineering, Electrical Engineering or an equivalent degree according to the educational system of the respective country) with a transcript of records.

The academic process consists of lectures and practical classes, laboratory work, independent work, research and work placement.

The teachers from other Departments of SPbPU and partner HEIs are involved in the programme delivery: Lappeenranta University of Technology, Leibniz University of Hannover, University of Genova, Brandenburg University of Technology Cottbus- Senftenberg).

The University maintains close international contacts in the sphere of research and education with the world's leading HEIs? Which ensures international dimension of the programme.

### **Areas for improvement:**

It should be stated publicly that official regulations for document recognition in the enrolment process of international students can take time.

The minimum entrance level of students' knowledge should be identified and adjusted to have a similar level of fundamental knowledge among students entering the Master programme and it should clearly be stated what is expected from the students right from the beginning of study.

The entrance tests should focus on fundamental knowledge of thermal engineering in order to avoid repetition in students' Master classes.

The stay of visiting professors at SPbPU should be extended and long-term visiting lecturers from European universities should be invited in order to guarantee intensified professorial mentoring and face-to-face interaction between teachers and students during the whole semester.

The institute should help international students to get employed within international companies in Russia while studying and actively create opportunities for international students working in scientific cooperation.

For international students, the organisation chart of the management and organisation structure of the institute should be translated into English.

### **STANDARD 5. Resources**

Compliance with the standard: **substantial compliance (good)**

#### **Good practice**

The demand for the programme makes it possible to draw necessary resources for its implementation.

The number and qualification of the teachers are adequate and sufficient. The Russian professors working at SPbPU are full-time employees, foreign researchers and teachers are hired under a contract of work and labour. In 2014-2016 the employment of visiting international lecturers was financed from the "5-100-2-20" Programme.

University teachers have to improve their skills at least once every three years within professional development courses including a course on methods of teaching in English. They regularly exchange experience with foreign colleagues and have voluntary further training in partner universities.

The Fundamental Library of Polytechnic University is one of the largest scientific and technological libraries in Russia, and rates among



the three best libraries in Saint Petersburg. The students are provided with textbooks. There are rooms for independent work. The library renders consultative and other services.

### **Areas for improvement:**

The institute should make sure to receive sponsorship from companies to adequately equip their laboratories with modern infrastructure.

More teaching staff with a comprehensive research background should be recruited as well as more researchers with a background in industry, especially in technical terms.

Further educational training for the teaching staff should be increased with regard to didactics and pedagogical qualities.

The process of recruitment and development for the teaching staff should be formalised with regard to research. It is necessary to involve teachers more in the research work, thus increasing the number of publications, particularly joint publications prepared with representatives of industry.

## **STANDARD 6. Quality assurance**

Compliance with the standard: **substantial compliance (good)**

### **Good practice**

The concept of quality assurance of SPbPU is reflected in its Quality Assurance Policy, developed and approved as part of the certified management system of the university.

SPbPU has developed and implemented a comprehensive quality assurance concept of the study programme, which is interconnected with the quality assurance system of the institution.

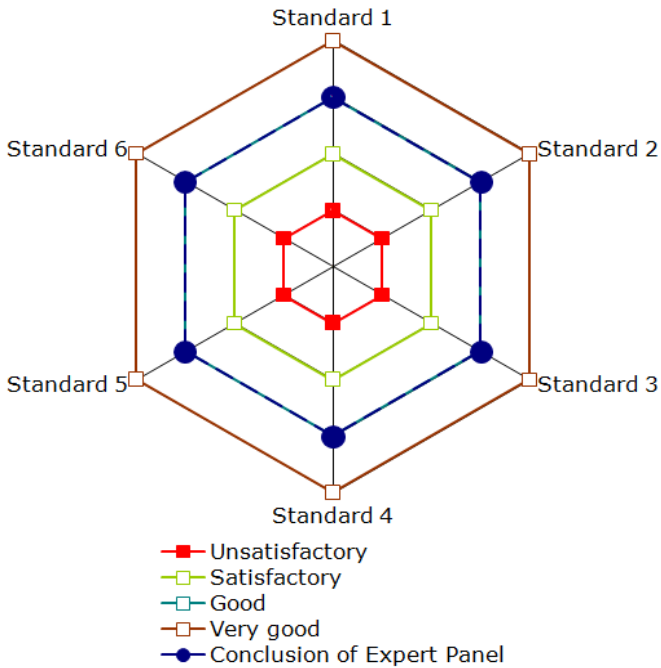
Mechanisms for closing quality feedback loops are established and regular feedback cycles are set in place.

### **Areas for improvement:**

It is necessary to develop an effective teacher-student feedback system.

On the basis of the available database of alumni and employers, it is necessary to develop a system of regular feedback on the advantages and disadvantages of the study programme, its relevance and compliance with the labour functions, the alumni have to fulfill in the workplace.

## DISTRIBUTION DIGRAM OF THE EXTERNAL REVIEW OUTCOMES



Standard 1. Programme profile

Standard 2. Curriculum

Standard 3. Student assessment

Standard 4. Organisation of the study programme

Standard 5. Resources

Standard 6. Quality assurance

## CONCLUSION OF THE EXTERNAL REVIEW PANEL

Based on the self-evaluation report analysis, documents and data submitted, interviews with the representatives of the professional communities, students, post graduates, doctor-degree students, staff and administration of the educational institution the External Review Panel came to the conclusion that the educational programme “Power Plant Engineering” in the field of study “Heat Power Engineering and Thermal Engineering” (13.04.01), delivered by Peter the Great St. Petersburg Polytechnic University **substantially complies** with the standards and criteria of public accreditation of the National Centre for Public Accreditation and evalag.

The External Review Panel recommends that the National Accreditation Board and Accreditation Agency evalag **accredit the educational programme “Power Plant Engineering” (13.04.01), delivered by Peter the Great St. Petersburg Polytechnic University.**

## SCHEDULE OF THE SITE VISIT OF THE EXTERNAL REVIEW PANEL

Time	Event	Participants	Participants
<b>April 10<sup>th</sup>, Monday</b>			
During the day	Experts' arrival to St.Petersburg, Transfer to the "Dostoevsky" Hotel (19, Vladimirsky prospect)		
17.00 – 18.30	Internal preparatory meeting of the expert team. Training.		Conference-hall "Dostoevsky" Hotel
20.00	Dinner (for foreign experts)		The Hotel cafe
<b>April 11<sup>th</sup>, Tuesday</b>			
8.20	Meeting in the Hotel hall (for foreign experts) Transfer to SPbPU.		"Dostoevsky" Hotel 19, Vladimirsky prospect
8.45	Arrival to SPbPU		16 <sup>th</sup> Academic Building, 28 a, Grazhdansky prospect
09.00 – 10.30	<b>Internal meeting of expert team</b>	Expert team	Room 220
10.30 – 11.30	<b>General meeting of the University heads, heads of departments and Expert team</b>	Rector, Vice-rectors, Heads of the departments, Expert team	Room 220
11.30 – 12.00	Document review. Expert evaluation of the graduation thesis works.	Expert team	Room 217
12.00 – 13.30	Lunch	Expert team	University canteen
13.30 – 13.45	Visits to the lecture and computer rooms		29, Gzhatskaya st.
13.45 – 13.50	Transfer to the SPbPU Main Building		29, Politekhnikeskaya st.
13.50 – 14.15	<b>Visit to the Library Complex</b>	Expert team	The Main Building Library
14.15 – 14.20	Cross-walk to the Institute of Energy and Transport Systems		Main Building 29, Politekhnikeskaya st.
14.20 – 15.15	<b>Meeting with Institute Director and Deputy Heads</b>	Institute Director, Deputy Heads, Expert team	Room 261
15.15 – 15.30	Coffee-break		Room 261
15.30 – 16.30	<b>Meeting with the program manager, teaching and administrative staff</b>	Head of the Department, program manager, program coordinator, Expert team	Room 261

Time	Event	Participants	Participants
16.30 – 17.30	<b>Tour through the Academic Building: visits to the main rooms, labs, equipment review</b>	Expert team	Mechanical Academic Building, Department and Lab; 4 <sup>th</sup> Academic Building,
17.30 – 18.00	<b>Meeting with employers and alumni</b>	Employers, Alumni, Expert team	Room 313
18.00 – 18.15	Internal EEC meeting	Expert team	Room 211
18.20	Transfer to the Hotel		
20.00	Dinner at the Hotel (for foreign experts)		The Hotel cafe
<b>April 12<sup>th</sup>, Wednesday</b>			
08.30	Meeting in the Hotel hall (for foreign experts). Transfer to SPbPU.		“Dostoevsky” Hotel
08.50	Arrival to SPbPU		16 <sup>th</sup> Academic Building 28a, Grazhdansky prospect
09.00 – 09.15	Internal meeting of expert team	Expert team	Room 217
09.15 – 10.15	<b>Meeting with students</b>	Students, Expert team	Room 220
10.15 – 10.30	Coffee-break	Expert team	Room 220
10.30 – 12.00	<b>Meeting with teaching staff</b>	Teaching staff, Expert team	Room 220
12.00 – 12.45	Extra meeting (upon request)	Expert team	Room 220
12.45 – 14.00	Lunch		University canteen
14.10 – 16.00	<b>Internal meeting of expert team. Assessment form completing, work with the report. Preparation of oral report.</b>	Expert team	Room 217
16.00 – 17.00	<b>Feedback to program management. Final meeting of expert teams with University representatives</b>	University representatives, Expert team	Room 220
17.00 – 17.30	Free communication with the experts		Room 220
17.40	Transfer to the Hotel		
20.00	Dinner at the Hotel (for foreign experts)		