

European Chemistry Thematic Network Association



Site Visit Report

For the application for the

CHEMISTRY Eurobachelor® LABEL

of the

St. Petersburg University

Institute of Chemistry

for the study programme

Chemistry, Physics and Mechanics of materials (B.Sc.)

Report on the site visit to the St. Petersburg State University, in connection with the application for the Chemistry Eurobachelor® Label.

Assessment Team

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Mikhail Fedotov – PhD in Technical Sciences, junior research officer “New metallurgic processes” laboratory, Institute of metallurgy and materials sciences” named after A. Baikov.

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Date and schedule of the site visit

17-18 September, 2019

Persons seen during the site visit

Rector, Deans, Heads of Laboratories. Subjects discussed.

M. Lavrikova The First Vice-rector for educational and methodical work, I. Balova - Director of Institute of Chemistry, staff responsible for the educational process, O. Levin – Head of the educational program, and S. Eliseeva Deputy Head of the program.

1) university strategy, facts about the university, special status of the university, programme development strategy, internal quality assurance, stately financed places and tuition fee, structure of the Chemistry BSc, Chemistry MSc, Chemistry PhD and Chemistry, Physics and Mechanics of materials, BSc, grades distribution table

2) Program managers: structure of the program, teaching methods, number of students and applicants, workload and timetable, research activity and research results, tutorial system, theory basics and practice-oriented knowledge, rating of teachers, possibility for graduates to teach biology, chemistry and physics in secondary school

Meeting with staff. Number of attendees. Subjects discussed.

A. Timoskhin, A. Shishov, M. Novikov, I. Prikhodko, M. Voznesensky, P. Tolstoy, O. Bakulina, A. Govdi, R. Islamova, A. Penkova, A. Povolotsky, D. Kirsanov, N. Resnina, E. Serebryakov

very talented students, good material and technical resources, e-courses, renovation of buildings, administration difficulties, possibility of increase of the number of places on fee-paying basis

Meeting with students. Number of Russian students. Number of foreign students. Subjects discussed.

Number of students - 12 students

elective courses, student mobility and dormitory possibilities, scholarship, money for published articles, job placement assistance, facilities, cold lecture halls, good level of mutual understanding between the teacher and the student.

Former students - around 12 students

soft skills need to be improved, 1-3 months usually takes the adaptation period at the workplace, good and solid knowledge basis is a prominent advantage, technology-machinery knowledge is missing, introduction to real industry is missing, lack of internship

Selected students - 4 students (4th year CPMM BSc)

discussion in English on the topic of the future thesis, theoretical background, feasibility of the project, equipment, students' presentation skills

Employers - 7 employers

All of the employers confirmed a good level of traditional education base and program's fitness-for-purpose (7:0), graduates of all levels are welcomed depending on the field (popularity MSc>PhD>BSc), hiring students, common thesis projects

Background of the Visit

The Institute of Chemistry of St. Petersburg University applied for international accreditation for its two BSc, one MSc and one PhD program. The international accreditation was performed as the guidelines of AKKORK described it and simultaneously the EuroLabel requirements of ECTN were checked as well (AKKORK is licensed by ECTN). The international experts were selected from the members of ECTN Panel of Experts, one expert for each program.

The Chemistry, Physics and Mechanics of materials is the newest programme of the institute. It was recently renewed taken into consideration several excellent programs developed at leading universities in US. The BSc is intended to be a high-level program for a limited number of very talented students, where multidisciplinary knowledge is taught in small student groups, where tutorial features are emphasized, and research-based method is applied for the 3-4 year students. The educational program is interdisciplinary and meets fully employers' requirements. The graduates are able to continue their studies at different MSc-s of the university or they can be employed as specialists of material and nano-sciences in the industry.

The main aims of the accreditation were to assess the programmes at an independent international level and to enhance the internationalisation of the programmes.

Subjects discussed in the Self-Evaluation Report and during assessment

1. Learning outcomes: Chemistry Eurobachelor[®]

1.1. Outcomes: Subject Knowledge

The subject knowledge of BSc in chemistry required by ECTN is fully taught in chemistry despite the multidisciplinary orientation of the program. This Bachelor program of 240 ECTS credits contains all basic disciplines required with a far more solid background in mathematics, physics and biology. The sum of these courses is at least 192 ECTS. All required fields as core chemistry are presented in the program as compulsory courses – it was checked in the course descriptions provided in Russian and it is shown in Table 2 of the self-evaluation report. The traditional scheme is applied, lectures and class-room practices cover the wide field of all sub-disciplines. Thereafter or in conjunction with it, the theoretical aspects of laboratory work are taught during the laboratory practices.

1.2. Outcomes: Generic Competences

Generic competencies are given by the extensively implemented lab reports, tasks and small presentations. The curriculum contains courses required by the national legalisation, we were not able to check their benefit beyond the general intelligence aspect. Many parts of the general competences can be obtained during the tutorial part of the training, especially during the researched-based part. Here the competencies are obtained mostly directly from the supervisors. The detailed list of Table 3 seems to be realistic, every of the generic competencies are touched at least in one course. We found, that in comparison to western European students their independency in lifestyle and critical attitude are less developed.

1.3. Outcomes: Chemistry-based Practical Skills

The ratio of practical related skills is rather large as can be seen in the study plan (Table 1) of the self-evaluation report. Usually around 1.6 hours of practical workload is applied for 1.0 hour lecture and around 1.0 hour other activities for a given course on basic chemical knowledge. It means, the practical (mostly class-room or laboratory parts) knowledge is around 40-50% of these subdisciplines. The most of these courses are integrated in a size, that can be considered as modules. During our visit we saw several basic labs. In the case of instrumental analysis laboratory experiments, we found that a part of the competences can be obtained during the research projects and the thesis task. This is especially true for the instrumentation of the St Petersburg University Research Park at the basement of the institute.

2. Content

The content of core chemistry in the programme fulfils the ECTN requirements, but without the elective courses it does not exceed it significantly. On contrary, the parts of

other science disciplines as mathematics, physics and biology are meaningful. The number of the compulsory credits is 156. The interdisciplinary fields have large emphasis in the programme, according to the programme aim. Far too many, too small elective and semi-optional courses are offered, the total course offer is 118. These courses were held in the last years even for very limited number of students. Unfortunately, there is a new regulation of the university management, that does not allow it. We think, this tutorial feature should be maintained and the university administration should tune the new regulation. On contrary to this tutorial system, it is easier to enhance mobility and to be internationally recognized by a clear-cut modular program. The academic disciplines must be designed according to the modular principle. The thesis holds reasonable credits, it fulfills the ECTN requirements. There is some fuzzyness how many credits can be assigned to the thesis, because some preliminary research credits can be counted there as well. St Petersburg University is actively involved in creating and promoting an accessible and high-quality online education. A broader knowledge on everyday aspects of chemistry, physics and material science should be introduced into the teaching to enhance scientific intellectual aspects of the programme. The same is necessary for industrial aspects, e.g. by introducing industrial visits (excursions) or a compulsory summer internship. Our question on an industrial topic to graduated students was answered with limited success.

2.1. The resources available for this programme (laboratories, library, ICT, advanced instrumentation)

The laboratories, as the whole building, are in rather diverse state. Facilities are improving and need further improvement. The accessibility of equipment (instrumentation) partly needs improvement. This concerns some opening hours as well of the St Petersburg University Research Park in the basement. In the case of basic lectures, harmonizing them with the content of leading foreign textbooks could increase the mobility and the recognition of the program abroad (e.g. such textbooks as T.W.G. Solomon et al.: Organic chemistry; J. Clayden: Organic chemistry; P. Atkins et al.: Atkins' Physical Chemistry; H.B. Callen: Thermodynamics and an introduction to Thermostatistics; M. Weller et al.: Inorganic Chemistry; P. Atkins et al: Shriver and Atkins' Inorganic Chemistry; D.A. Skoog et. al: Fundamentals of analytical chemistry; D.C. Harris: Quantitative chemical analysis). The collection of the library might be supplemented by these contemporary textbooks and the improvement of the library to be an engaging self-study place might be feasible. There is an international trend where an uncontrolled 0-24 hourly open library became the first place for performing self-study. Wide range of international journals and SciFinder are accessible on-line.

2.2. Laboratory safety

Safety precautions should be improved and kept. This refers in particular to student labs. We found labs, where the students did not wear safety glasses, the emergency shower was missing and there were no kits for emergency eye washing. The access to the first aid kit was also rather complicated. Officially, all students have to be educated for the safety

instructions for each lab, but we did not get the signed copies of their participation on the training. On contrary, for some labs we found the safety aspects to be more or less applied, mostly in the better equipped new labs or the labs where secondary school students were taught for international championship. The safety was different in the research labs, here the variety seemed to be rather large. The organizations must provide students with disabilities with comfortable, safe work environment.

We think, that all instrumentation that does not meet current safety standards has to be removed and all basic safety regulations have to be taken as soon as possible. We hope, the central university administration helps to the institute to build the necessary equipment in the very near future.

2.3. Are electronic media used for teaching, learning and/or assessment like EChem Test officially used in the Chemistry Eurobachelor[®] programme?

The combination of academic traditions of the St. Petersburg state University and modern educational technologies of e-learning provides quality education at a convenient time. The content of most lectures may be made available via Blackboard or as hand-outs. Some of the courses, especially compulsory non-chemical ones with respect to national legalisation are given only on-line. During our site visit we faced to some week organization of the lectures, e.g. their exact schedule and the changes (time and place) were not accessible through internet.

2.4. Distribution of Credits

The distribution of credits is correct, the student load is balanced. The ratio of the theoretical and practical loads is correct. The research activities are partly recompensated by credits, the extra activity is over the programme frame.

3. ECTS and Student Workload

The student workload is higher than usual at this level of education. It suits well to the scheme, that here selected students studies. There are 26 applicants for each position, that means the students have very good secondary school background and large motivity. Their workload officially is according to the Russian regulation, but most of the students take part in research activities after the first-second year. Unfortunately, this workload prohibits to broaden their knowledge outside of their discipline. It is also not supported by the university management to visit courses of other disciplines with full recognition. It is hindered by the spatial isolation of the science campus from the other parts of the university, as well. The student workload is distributed over the whole semester, there are methods where milestoning are used via several tasks and mid-term exams during the lecture period. The only problem seems to be the case, where too many semi-optional/elective courses are chosen by a student, it may cause a large number of classical exams in the exam period of the semester. There are several zero credit non-chemical courses mostly related to Russian laws. Their charging with credits is mandatory in many Western European countries.

4. Module / Course unit descriptions (special attention to learning outcomes)

The course descriptions are clear as well their summary in Table 1. The learning outcomes of the self-evaluation report is correct in Tables 2-3. The outcomes, especially the chemical knowledge and practical competencies are clear-cut goals of the courses. The ratio of the different parts of the combined courses is clear. The workload is described in hours.

4.1. Mobility of students and staff

The mobility of the students is limited during the CPMM BSc. Whole semester mobility is very rare, it is custom only to leave for a few weeks research visit to an international partner on the field of the thesis. There is no official cause for the low mobility, all courses are declared to be transferable. The ingoing mobility is also very limited. A change to a financially more feasible client- oriented scheme with international students paying tuition fee may enhance the short time ingoing mobility as well. To enhance student mobility an advanced modular system should be introduced, where large modules can flexible be replaced by courses acquired at another university. Staff members are mostly researchers who up to now have international cooperation and they travel there for shorter or medium long visits. The BSc program does not contains compulsory English courses. The most of the courses should be at the core of the bilingual BSc in Chemistry, Physics and Mechanics of materials program.

5. Methods of Teaching and Learning

The quality of education is high, the offer of courses is very broad. The teaching staff is well trained and the students are very talented. The programme is taught basically via two methodological ways, by classical frontal lectures and fixed practices and thereafter in the higher semesters by research-based way. More modern teaching techniques should be implemented also in the case of basic courses, the traditional frontal lectures should be supplemented by self-study, problem and context-based methods. The research-based part is effective up to resulting publications for around the half of the thesis works. The lecture halls are conventionally equipped, they might be modernised.

6. Assessment Procedures and Performance Criteria

As mentioned earlier, the student workload is distributed over the whole semester, there are methods where several tasks and mid-term exams are assessed in the lecture period. When too many semi-optional/elective courses are chosen by a student, it causes large number of exams at the end of the semester. The most part of the midterm tasks and exams is written ones, while the exams are written or oral ones. The assessment is usually not anonymous, the use of independent assessing of written exams or the use of examination boards for oral ones is not used for usual courses. Some of the courses are assessed electronically via Blackboard. The students' performance during the year can be followed electronically and it warns the students, if they may have any problem. The thesis defence and the final exam are managed before an independent/partly external board.

7. Grading

The grading is organized according to the general laws in Russia.

8. The Diploma Supplement

The diploma supplement is issued in Russian and in English and its form fulfils the local regulations. The rewritten of the diploma supplement to a competency based one according to the Budapest descriptors has not been started.

9. Quality Assurance

The university seems to have a clear system to ensure internal quality assurance. Different councils are created to taken into account by the management in order to get teachers' and students' opinions. The lectures are monitored by surveys and visiting students' numbers. The scientific and teaching activities of the staff are monitored and their contracts are renewed according to these data. The Student Council is very active and successful. They have influence on the programme development

9.1. Numbers of graduates in the past five academic years and forecast for the next years

The number of the starting and the graduating students are around 10 yearly according to the stately financed number of places. Very few students intend to pay tuition free, at least from Russia. The internationalization of the programme may result a higher number of foreign applicants. The facilities and the teaching capacities are large enough for higher number of students. We ask the administration to act as a pressure group for a doubling of the stately financed places.

10. Employability of the graduates during recent years and expectations for the future

The CPMM BSc program is well organised and fits well to the clear BSc-MSc-PhD structure of the university. The BSc provides an excellent opportunity to being continued on many different multi- and interdisciplinary MSc-s. There is no MSc equivalent of the CPMM BSc, but the chemistry MSc and the interdisciplinary nanoscience MSc are effective way for the continuation of the study. The program seems to provide graduates highly accepted and demanded on regional market. This is a program for a new academic field where no directly trained graduates were accessible previously. The discussion with the representatives of the employers highly supported this. An internship would enhance the connection to the corporate world and therefore more innovative tasks would be possible to be assigned to the students. The employers prefer MSc>PhD>BSc graduates in the local region. The survey among them justified the good training of the university. All of the employers asked to prefer the "well-educated" model contrary to the "fit-for-purpose" one. The CPMM BSc provides surely "well-educated" graduates, in accordance to the Russian traditions.

11. Ethical concern

The basics of scientific and research ethics are covered in the programme (see table 3), but sometimes implicitly in the research period. It is a required task of the supervisors

and it is successfully provided by them. We touched ethical questions in discussions with the students, their attitude seemed to be correct.

Internal part

1. Conclusions

Short summary of the assessment. If conditions have to be fulfilled before the Eurolabel® can be awarded, these conditions should be described in detail and proposals should be made for the subsequent procedure.

The Assessment Team may propose awarding a Eurolabel® but define particular conditions and/or recommendations to be obeyed by the awardee.

The Assessment Team arrives at the conclusion that on the basis of the submitted application and the site visit the study programme Chemistry, Physics and Mechanics of Materials BSc (Химия, физика и механика материалов) at the Institute of Chemistry, St. Petersburg State University meets the requirements for the Chemistry Eurobachelor® Label.

It is therefore suggested to award the Institute of Chemistry at St. Petersburg State University with the Chemistry Eurobachelor® Label for the Study Programme Chemistry, Physics and Mechanics of materials BSc (Химия, физика и механика материалов).

According to the agreement with the applicant the certificate should be issued for students starting their study between Month Year and Month Year.

2. Conditions have to be fulfilled within one year after the label has been awarded.

All instrumentation that does not meet current safety standards has to be removed and all basic safety regulations have to be taken as soon as possible.

3. Recommendations are advices offered for consideration by the management of the institution, carrying into execution being surveyed during revalidation of the Eurolabel®.

Please introduce a clear-cut modular structure to enhance mobility and international recognition.

Please increase the subject knowledge on industrial chemistry, by courses, industrial visit or compulsory internship.

Please add grade distribution table to the diploma supplement or make them public, if the legalisation does not allow it.