Decision Regarding Assessment of the Engineering, Manufacturing and Technology Study Programme Group at the Level of Doctoral Studies Tallinn University of Technology

02/02/2018

The Quality Assessment Council for Higher Education at the Estonian Quality Agency for Higher and Vocational Education decided to approve the report by the Assessment Committee and to conduct the next quality assessment of doctoral studies in the Engineering, Manufacturing and Technology study programme group at Tallinn University of Technology in seven years.

On the basis of subsection 10 (4) of the Universities Act and point 40.1 of the 'Quality Assessment of Study Programme Groups at the Level of Doctoral Studies', authorised in points 3.7.3 and 3.7.1 of the Statutes of the Estonian Quality Agency for Higher and Vocational Education (hereinafter referred to as 'EKKA'), the EKKA Quality Assessment Council for Higher Education (hereinafter referred to as 'the Council') affirms the following:

1. On 9.01.2017 Tallinn University of Technology and EKKA agreed upon a time frame to conduct the quality assessment of the study programme group.

2. The Director of EKKA, by her order of 28.08.2017, approved the following membership of the quality assessment committee for the quality assessment of the third cycle of higher education in the Engineering, Manufacturing and Technology study programme group at University of Tartu, Tallinn University of Technology and Estonian University of Life Sciences (hereinafter referred to as 'the Committee')

Mark G Richardson	Chairman of the committee, Professor Emeritus; University College Dublin (Ireland)
Simo-Pekka Hannula	Professor, Aalto University (Finland)
Klaus Hellgardt	Professor, Imperial College London (United Kingdom)
Marios Kassinopoulos	Professor, Cyprus University of Technology (Cyprus)
Pille Meier	Estonian Forest and Wood Industries Association, Theme leader for processing industry and education (Estonia)

Henrik Persson	PhD student, Lund University (Sweden)
Jan-Eric Ståhl	Professor, Lund University (Sweden)

3. Tallinn University of Technology submitted the following third cycle study programmes for assessment in the Engineering, Manufacturing and Technology study programme group:

Chemical and Materials Technology (doctoral studies)
Mechanical Engineering, (doctoral studies)
Power Engineering and Geotechnology (doctoral studies)

4. Tallinn University of Technology submitted the self-analysis report to EKKA on 14.07.2017, which the assessment coordinator forwarded to the committee on 22.08.2017.

5. Assessment visit to Tallinn University of Technology took place 19-20.10.2017.

6. The committee submitted the draft assessment report to EKKA on 9.12.2017, which was sent to the university for comments by EKKA on 9.12.2017 and to which Tallinn University of Technology delivered its response on 22.12.2017.

7. The Committee submitted its final assessment report to EKKA on 08.01.2018. The assessment report is an integral part of the decision. The report is available on the EKKA website.

8. The Secretary of the Council forwarded the Committee's final assessment report along with the University's self-evaluation report to the Council members on 18.01.2018.

9. The Council with 7 members present discussed these received documents in its session on 2.02.2018 and, based on the assessment report, decided to point out the following strengths, areas of improvement, and recommendations regarding the Engineering, Manufacturing and Technology study programme group at the level of doctoral studies at Tallinn University of Technology.

General recommendations regarding the financing of research and doctoral studies

1) The overall level of national funding for R&D in Estonia and the systematic negative consequences of the high fraction of competitively awarded funding for R&D, compared to baseline funding, lead to systemically detrimental consequences. The proportion of baseline and competitively awarded funding for R&D in universities needs to shift closer to 60%, rather than the current 30%. The portion of investment in R&D through the public university sector should be targeted at a level of 1% of GDP by 2020 through ring-fencing one third of R&D funding envisaged in the "Estonia 2020" competitiveness strategy.
2) The stipend paid to doctoral students is way below adequate compared to the cost of living. A culture has grown up of 'hobby Ph.D. students' - a situation whereby it is deemed acceptable for a Ph.D. student to be in full-time employment outside the university for economic reasons. These individuals are unable to engage in research to a required degree nor contribute to the life of the university community. The relatively low level of the value of the stipend is seen as a measure of the low value attaching to doctoral studies by Estonian society, with consequent problems in attracting and retaining the best students. Therefore it is recommended that annual state investment in university R&D be raised to at least 1% of GDP. Furthermore, it is also

recommended that a portion of increased R&D investment be ring-fenced to bring the level of the state funded Ph.D. student stipend to a baseline figure of €1100 per month (replicating the baseline figure already in place through top-up funding in at least one of the public universities) as soon as possible.

General areas for improvement and recommendations for the Engineering, Manufacturing and Technology Study Programme Group at the Level of Doctoral Studies at University of Tartu, Estonian University of Life Sciences and Tallinn University of Technology

1) Those in full-time doctoral studies are sometimes tasked with significant teaching responsibilities as part of their financial top-up package. Their workload can become excessive and out of balance with that of a full-time research student with consequent impact on timely completion of studies.
2) Because a doctoral student's income is partly tied to a research grant, the research questions that form the core of their PhD study may fall outside the scope of the grant. This then deprives them of freedom to devote time and research resources to independent exploration of research hypotheses.
3) The recruitment practice of doctoral students lacks transparency, which can lead to universities potentially missing out on best-qualified candidates. It is recommended that each government funded PhD opportunity be marketed internationally in a timely manner with associated mandatory and desirable criteria specific to the research project. Candidates should be assessed by a departmental doctoral studies committee against the published criteria and places offered in a transparent manner with feedback available upon request to rejected applicants. In order to ensure equal opportunities for foreign applicants the recruitment cycle should be in line with the relevant international practice.
4) Career development of academic staff may be hindered by the situation whereby they cannot get on the ladder of winning research funding until they have a record of principal supervision of research students but they need to win funding before they are allocated principal supervision of doctoral students.
5) At present Estonian society and industry fail to see to a sufficient extent the added value of highly qualified researchers. It is recommended that university-industry interaction be enhanced through the establishment by engineering departments of Industry Advisory Boards involving representatives from the technology industry. Likewise it is recommended that public universities widely pilot Industrial Doctorates, based on the Danish model, with such PhD students spending approximately half of their time in the university and half in the industrial company.
6) The pace of internationalisation of the learning experience by PhD students is slow. In order to improve the international competitiveness of graduates, it is recommended that university managements conduct a review of barriers to internationalisation of the doctoral student experience leading to an action plan of proactive measures to promote an inclusive study environment for doctoral students. The aim of proposed measures should be to harness the integration of diverse cultures and varied prior graduate educational experience as an every-day part of a challenging and thought-provoking collegiate PhD study environment.
7) The sustainability of doctoral schools is potentially threatened by the end of EU funding. It is recommended that a review of the funding model be undertaken to ascertain the optimal model for ensuring sustainability of the doctoral school network, especially when European Regional Development Fund support ends.
8) In order to improve collaboration between universities participating in doctoral schools, the funding of joint activities of partner universities should take place on fair terms and conditions.

Doctoral schools should be given the opportunity to devise joint courses that could be made available to students from all participating universities. Adding an online learning component to cooperation would avoid the duplication in the use of scarce resources as well as ensuring critical mass of participants on specialized courses.

9) Transition to tenure track system may bring unforeseen consequences. In order to ensure equal development of supervision of doctoral students and research, doctoral studies in universities should be conducted under the supervision of academic staff with workloads that integrate education, research and innovation without the ability to opt out of time devoted to any one of these aspects of workload. Recruitment and promotion policies should reflect ability and performance under all above-mentioned aspects.
10) Opportunities posed by doctoral studies to develop a strong work and safety culture in Estonian industry are not being used to full effect. Formal assessment of doctoral students' skills and knowledge after safety briefings is recommended.

Supplementary strengths and areas for improvement of the Engineering, Manufacturing and Technology Study Programme Group at the Level of Doctoral Studies at Tallinn University of Technology

Strengths

1) The infrastructure for conducting doctoral studies is state of the art. European Union structural funds are successfully used for inter-institutional doctoral schools with other universities.
2) There is strong student satisfaction with the working atmosphere. Doctoral students are treated as colleagues in their research groups.
3) The annual attestation of all doctoral students is working effectively, ensuring timely feedback to students on their rate of progress and standard of work, resulting in increasing compliance with the nominal study period.
4) TalTech merits recognition for being the first public university to have implemented a uniform support system for all doctoral students, linking it to the cost of living. This fosters competition with industry and gives clear indication of the value of graduates to society and economy.
5) Many key initiatives have already been, or are in the process of being, implemented which support high quality doctoral studies including the introduction of a common salary structure; tenure track system for staff; stricter review of attestation and progression requirements as well as increased role for industrial PhDs.
6) The restructuring of the engineering department at TalTech into five institutes and two colleges has been successful.

Areas for improvement and recommendations

1) TalTech has an opportunity to take a lead on the greater participation of universities in Estonian industrial development through research including industrial PhD's.
2) Estonian education system would benefit from TalTech sharing their best practices with other Estonian universities via cooperation fostered through doctoral schools.
3) More needs to be done to attract more international students to the study programmes.
4) The distribution of the 60 ECTS across basic and intermediate modules should be reviewed.

Chemical and Materials Technology

Strengths

1) The research focus is outward and forward looking, with many new ideas and initiatives.
2) Doctoral students' research results can be used for product development.
3) The facilities are of a very high standard. All research laboratories in the Faculty of Chemical and Materials Technology have been renovated in recent years and investment in equipment exceeded €3 million. Research laboratories are well laid out, clean and tidy. The lecture and seminar rooms are well-equipped and modernized. Access to research databases is very good.
4) Academic staff are highly qualified internationally recognized professionals.
5) A competition model for allocating doctoral studies topics and supervisor opportunities has been established. This ensures the highest quality of supervision for doctoral students.
6) Research and teaching are tightly integrated in all aspects and all members of teaching staff are involved as supervisors to doctoral students.
7) The Assessment Team was very impressed by the enthusiasm and openness of the PhD students. All had only positive comments regarding their educational experience.
8) The drop-out rate has been reduced.
9) There are numerous funding opportunities for students to gain international experiences (exchanges, conferences, workshops etc.)

Areas of improvement and recommendations

1) It will be useful to tighten the criteria for admission to a PhD programme, in part to address the current practice that appears to favour the appointment of TalTech master's degree students.
2) The number of doctoral students per supervisor is very high in some cases. It is recommended that the new rules according to which the number of supervised students should be limited to 5 be fully implemented.
3) The safety culture at TalTech could be improved further, e.g. a UV protection shroud should be available for the operation of high power solar simulator, when working with potentially toxic gases, an appropriate gas detection system (alarm) should be installed. Along the same lines it would be good to improve on the use of Activity Risk Assessments as these are commonly found in industrial settings and would be more personal to student research plans as a supplement to generic safety exams and annual fire drills.
4) It would be useful to develop a funding plan for maintenance, upgrading and replacement of equipment, especially aiming at the reduction of reliance on overheads from competitively-won national funding.
5) TalTech should pursue more company related projects in order to support the development of a thriving industrial PhD programme and also to reduce the dependency on e.g. EU project income.
6) It is not clear how the teaching load is divided among the doctoral students. It is recommended that clear rules be set on the expected teaching load of each doctoral student as part of their training, whether credits are given or not and fixing of the maximum amount of teaching load of doctoral students in the study programmes.
7) The share of international teaching staff is quite low; it is recommended that the university take action to increase the number of international staff members as this would help the whole community in internationalization efforts.
8) In the case of industrial doctoral students the question of supervisors available from industry is essential. The university should identify the companies, where its alumni are working and extend systematically the co-operation with these companies.

Mechanical Engineering

Strengths

1) Both staff and the doctoral students are satisfied with the state of the laboratories and the equipment. The research laboratories are being upgraded on a rolling basis using resources from R&D projects. Sustainability of investment source is assured to 2023 through support of over 20 companies in joint projects through IMECC competence centre.
2) The approval of doctoral thesis topics and thesis distribution is based on competition between supervisors. This ensures the highest quality of supervision to doctoral students.
3) Teaching staff participate in doctoral thesis defence panels abroad. Similarly high quality international scientists participate in local doctoral thesis defence panels or give lectures to PhD students.
4) The doctoral students are very positive about their research education.

Areas for improvement and recommendations

1) In some cases the number of supervised doctoral students per supervisor is too high. It is recommended that the new rules according to which the number of supervised students should be limited to 5 be fully implemented. Moreover, an international co-supervisor could be appointed to each doctoral student.
2) The guidelines, "Estonian Universities, Agreement on good practice regarding quality", that already exist for the supervision of graduate students should be adhered to.
3) Rules regarding admissions and prerequisites for industrial PhD students should be further investigated. Due to fact that EU funding is expected to decrease in the coming years, it is proposed to increase the admission of industrial PhD students.
4) Better conditions should be created for increased international mobility of doctoral students and other staff.
5) For the personal evolvement, education, and later thesis defence, of the PhD-students, the analysis and usage of advanced equipment is important. The training on, for example, SEM (scanning electron microscope) could be used in the curriculum.
6) Training in application writing would be an excellent addition to the doctoral study programme.
7) It is important that the projects in the doctoral education are carefully chosen so that these can be carried out with the internally or externally available equipment.
8) It is recommended that teaching by doctoral students be clearly defined as regards workload and subjects of teaching/supervising. Teaching duties should directly relate to their thesis topic.
9) It is recommended that visiting lecturers such as high tech industrial scientists be invited more often to contribute to the training of students.
10) It is recommended that the university organize a better collaboration with industry in general in order to attract more thesis topics and more industry-based scientists for supervision of the doctoral programme - currently these are very limited.
11) Teaching and research activities do not always leave enough time for teaching staff to spend on students' supervision. It is recommended that supervisors monitor time allocated to all tasks such that there is adequate space for high quality students' supervision.

12) Consideration should be given to compulsory international mobility of doctoral students for at least one month.
13) Clear instructions should be proclaimed for each equipment, in order to ensure health and safety.

Power Engineering and Geotechnology

Strengths

1) A variety of sources exist for financial support available to doctoral students for participation in international conferences and international mobility.
2) The doctoral study programme is being updated. The target is to ensure a more broad-based programme and supports the interdisciplinary development.
3) The PhD students researching Energy Systems benefit from the application of TalTech research in the Estonian power grid.
4) The research laboratories in the Faculty of Power Engineering are well equipped. The feedback from doctoral students on the adequacy of the resources is positive.
5) The University ensures that sufficient resources exist before approving each doctoral supervision.
6) The quality of supervision is now assured through a ranking system, which assigns competitively-won scholarships to the research projects of staff with the best records of publications, citations, and successful doctoral study supervision completions during the previous ten years. Mentorship of new staff in supervising PhD students is commonplace through co-supervision.
7) The employment of doctoral studies graduates is very high. This shows that the PhD programme is successful and suitable for the local industry.

Areas of improvement and recommendations

1) In order to further enhance the effectiveness of the doctoral programme of Power Engineering and Geotechnology it is recommended to revise the learning outcomes so that they are less generic and more discipline-specific.
2) In order to help international students fully acquire the desired transversal skills it is recommended to offer in English all the modules of the general studies.
3) It is recommended that a course on Project Management be included in the elective courses of the General Studies module.
4) Attention should be paid to training younger teaching staff supervising skills. A structured staff recruitment plan is required to that end.
5) A funding plan for maintenance, upgrading and replacement of equipment is recommended that reduces dependence on overheads from competitively-won national funding.
6) Consider the introduction of agreed common software licences across a number of engineering programmes in the University, such as Matlab.
7) Teaching load of students should be clearly regulated in order to ensure a balance between research and teaching.
8) Researchers and scientists from high quality universities abroad should be invited to co-supervise theses.
9) It is recommended that the admission requirements be applied in a uniform and transparent manner for all students.

10) The University should investigate any current impediments to the enrolment of international students to the study programme and draw up an action plan to address any concerns. For example, the possibility of including prospective international doctoral students in summer schools connected with their proposed research group should be considered.

10. Point 40 of the 'Quality Assessment of Study Programme Groups at the Level of Doctoral Studies' establishes that the Quality Assessment Council shall approve an assessment report within three months after receipt of the report. The Council shall weigh the strengths, areas of improvement, and recommendations outlined in the assessment report, and decide whether to conduct the next quality assessment of that study programme group in seven, five or three years.

11. The Council weighed the strengths, areas of improvement, and recommendations presented in point 9 of this document and found that the study programme, the teaching conducted under these programmes, and development activities regarding teaching and learning conform to the requirements, and

DECIDED

to approve the assessment report and conduct the next quality assessment of the third cycle of studies in the Engineering, Manufacturing and Technology study programme group at Tallinn University of Technology in 7 years

The decision was adopted with 7 votes in favour. Against 0.

12. The Council proposes that Tallinn University of Technology submit an action plan to EKKA concerning the areas for improvement and recommendations pointed out in the report no later than 02.02.2019.

13. A person who finds that his or her rights have been violated or his or her freedoms restricted by this decision may file a challenge with the EKKA Quality Assessment Council within 30 days after the person filing the challenge became or should have become aware of the contested finding.

The Council shall forward the challenge to its Appeals Committee who shall provide an unbiased opinion in writing regarding the validity of the challenge to the Council, within five days after receipt of the challenge. The Council shall resolve the challenge within ten days of its receipt, taking into account the reasoned opinion of the Appeals Committee. If the challenge needs to be investigated further, the deadline for its review by the Council may be extended by a maximum of thirty days.

A legal challenge to this decision is possible within 30 days after its delivery, by filing an action with the Tallinn courthouse of the Tallinn Administrative Court under the procedure provided for in the Code of Administrative Court Procedure.

Tõnu Meidla
Chair of the Council

Hillar Bauman
Secretary of the Council