

## **Decision Regarding the Assessment of the Engineering, Manufacturing and Technology Study Programme Group**

**Tallinn University of Technology**

**28/03/2016**

**The Quality Assessment Council for Higher Education of the  
Estonian Quality Agency for Higher Education and VET  
decided to approve the report by the Assessment Committee  
and to conduct the next quality assessment of the  
Engineering, Manufacturing and Technology study  
programme group in the first and second cycles of higher  
education at Tallinn University of Technology in seven years,  
with a secondary condition**

On the basis of subsections 12<sup>2</sup> (1) and 10 (4) of the Universities Act, point 3.7.3 of the Statutes of the Estonian Quality Agency for Higher Education and VET (hereinafter referred to as 'EKKA') and point 41 of the document, 'Quality Assessment of Study Programme Groups in the First and Second Cycles of Higher Education', authorised in point 3.7.1 of the above-mentioned EKKA Statutes; the Quality Assessment Council for Higher Education of EKKA (hereinafter referred to as 'the Council') affirms the following:

1. On 25.11.2014 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 orders on 17.08.2015 and on 27.08.2015, approved the memberships for two quality assessment committees for the Engineering, Manufacturing and Technology study programme group in the first and second cycles of higher education at Tallinn University of Technology (hereinafter referred to as 'Committee One' and 'Committee Two').

### 2.1. Committee One:

Prof. Jan-Eric Ståhl, Chair, Lund University, Division of Production and Materials Engineering; Sweden

Prof. Emer. Job van Amerongen, University of Twente; Netherlands

Hermann Blum, ESU nomination, ETH Zürich, Student; Switzerland

Prof. Sigurdur Brynjolfsson, University of Iceland, Faculty of Industrial Engineering, Mechanical Engineering and Computer Science; Iceland

Prof. Panicos Kyriacou, City University London; United Kingdom

Prof. Janusz Uriasz, Head of Institute of Marine Technology/Maritime University of Szczecin, Member of Polish Accreditation Committee; Poland

Madis Võõras, Enterprise Estonia, Innovation Division Manager; Estonia

## 2.2. Committee Two:

Prof. Markus Mueller, Chair, University of Edinburgh; United Kingdom  
Prof. Klaus Hellgardt, Imperial College London; United Kingdom  
Prof. Olle Holst, Lund University; Sweden  
Prof. Jorma Hölsä, University of the Free State; South Africa  
Asnate Kažoka, ESU nomination, Riga Technical University, Student; Latvia  
Prof. Peter Palensky, TU Delft; Netherlands  
Prof. Marketta Sipi, University of Helsinki; Finland

## 3. Tallinn University of Technology submitted the following programmes for evaluation under this study programme group:

### 3.1. Environmental Engineering and Management (MSc)

**Biomedical Engineering and Medical Physics (joint programme with the University of Tartu, MSc)**

**Health Care Technology (MSc)**

**Integrated Engineering (BSc)**

**Mechatronics (BSc)**

**Mechatronics (MSc)**

**Product Development and Production Engineering (BSc)**

**Product Development and Production Engineering (MSc)**

**Thermal Power Engineering (BSc)**

**Thermal Power Engineering (MSc)**

**Industrial Engineering and Management (MSc)**

**Design and Engineering (joint programme with the Estonian Academy of Arts, MSc)**

**Fishing and Fish Processing Technology (Prof HE)**

**Refrigerating Technology (Prof HE)**

**Operation and Management of Marine Diesel Powerplants (Prof HE)**

**Marine Engineering (Prof HE)**

### 3.2. Electrical Power Engineering (BSc)

**Electrical Power Engineering (MSc)**

**Electrical Engineering (BSc)**

**Electrical Drives and Power Electronics (MSc)**

**Distributed Energy (joint programme with the Estonian University of Life Sciences, MSc)**

**Chemical and Environmental Technology (BSc)**

**Chemical and Environmental Technology (MSc)**

**Technology of Wood and Textile (BSc)**

**Technology of Wood and Plastic (MSc)**

**Materials and Processes for Sustainable Energetics (joint programme with the University of Tartu, MSc)**

**Food Engineering and Product Development (BSc)**

**Food Engineering and Product Development (MSc)**

**Power Engineering (Prof HE)**

**Machine-Building Engineering (Prof HE)**

**Industrial Automation (Prof HE)**

**Fuel Technology (Prof HE)**

**Fuel Chemistry and Technology (MSc)**

4. Tallinn University of Technology submitted the self-evaluation report on the first group of study programmes to the EKKA Bureau on 8.09.2015 and the assessment coordinator forwarded it to Committee One on 9.09.2015. Tallinn University of Technology submitted the self-evaluation report on the second group of study programmes to the EKKA Bureau on 11.09.2015 and the assessment coordinator forwarded it to Committee Two on 21.09.2015.
5. Assessment visits were made to Tallinn University of Technology during 10–12.11.2015 (Committee One) and during 24–26.11.2015 (Committee Two).
6. Committee One sent its draft assessment report to the EKKA Bureau on 22.12.2015, EKKA forwarded it to Tallinn University of Technology for its comments on 29.12.2015, and the University delivered its response on 13.01.2016. Committee Two sent its draft assessment report to the EKKA Bureau on 14.01.2016, EKKA forwarded it to Tallinn University of Technology for its comments on 15.01.2016, and the University delivered its response on 26.01.2016.
7. Committee One submitted its final assessment report to the EKKA Bureau on 20.01.2016. Committee Two submitted its final assessment report to the EKKA Bureau on 28.01.2016. Those assessment reports are integral parts of the decision, and are available on the EKKA website.
8. The Secretary of the Council forwarded the final assessment reports along with the self-evaluation reports to the Council members on 28.01.2016.
9. The Council with 9 members present discussed these received documents in its session on 28.03.2016 and decided to point out the following strengths, areas for improvement, and recommendations regarding the Engineering, Manufacturing and Technology study programme group in the first and second cycles of higher education at Tallinn University of Technology.

#### **9.1. Assessment at the Level of Study Programme Group**

##### **Strengths**

- The quality of education and research conducted in the study programme group is comparable to the majority of similar universities in Europe.
- Infrastructure for education and research is of good quality.
- The University has an excellent library that provides access to a wide selection of publications and electronic resources.
- Teaching staff is committed and sufficiently qualified to achieve the learning outcomes of the programmes.
- Collaboration between employers and programme managers is very good and regular.
- The employment rate of the graduates is very high and employers are pleased with the graduates.
- In recent years TUT has made good progress towards internationalisation, which has resulted in a growing number of master degree programmes delivered in English as well as in an increasing number of international students.
- TUT's Study Information System is informative and well structured, providing necessary information on all programmes and courses, and which supports teaching in the study programme group.
- MEKTORY is a fantastic and unique part of the University that effectively supports learning and teaching in the study programme group. It is an incubator where students can engage in practical entrepreneurial activities.

##### **Areas for improvement and recommendations**

- Teaching should be given the same priority as research at TUT. Requirements for research and teaching activities of the teaching staff should be clearly defined and harmonised.
- Teaching and research staffs are reviewed every five years at present, with an emphasis on research. It is very difficult for the staff to plan their career development in five-year cycles, therefore it is advisable to review staff's achievement of objectives for research and teaching annually, giving equal emphasis to both research and teaching.
- Internationalisation should be continued and the number of courses and programmes taught in English in the Engineering, Manufacturing and Technology study programme group increased.
- International student mobility is low, and it should be increased.
- Partnerships with leading international universities are few, TUT seems to position itself regionally rather than internationally. The Committee believes that such approach is not justified. There should be more collaboration (including joint programmes) with leading international universities.
- Teaching staff's research activities and the results thereof should be more visible internationally. There should be more international collaboration producing specific results.
- In the first two years of bachelor degree programmes, the students have too few choices, the programmes should be of a more multidisciplinary character. A trend should be established towards offering more broad-based bachelor degree programmes.
- Employers are of the opinion that graduates are lacking soft skills. Bachelor degree programmes should include subjects that support development of management, communication and presentation skills.
- Admission requirements should be defined more clearly for master degree programmes, and the different levels of prior education of incoming students should be taken into account when organising the studies. Students from different bachelor degree programmes often lack the backgrounds required for a specific master degree programme, but the students who have graduated from a bachelor degree programme of the same speciality complain of repetitions existing between the bachelor and master degree courses.
- Closer collaboration among different disciplines/institutes would ensure more efficient use of both the time and physical resources.
- Strategic investments must be planned to make it possible for the laboratories to be updated even after the project-based funding has expired.
- It is necessary to investigate more thoroughly the reasons students drop out, and to devise a strategy to decrease the dropout rates.
- It is advisable to tie the contents of first- and second-year courses more closely to the specialities.
- Teaching and research staff should be offered professional assistance in writing applications for research grants.
- A mentorship programme should be introduced to assist younger staff members who have doctoral degrees.
- In order to ensure sustainability of the study programmes, a recruitment policy should be developed which would also take into account the needs created by future retirements.
- Cooperation with employers and other stakeholders should be formalised at the level of the leadership as well as the teaching and research staff of the University.
- The Committee recommends that more positions be created for visiting lecturers from industrial enterprises so that employers might contribute more into the teaching, and the University could enhance its collaboration with companies.
- Student feedback should be improved, relying on initiatives taken by Student Quality Groups rather than by making it compulsory to fill out existing questionnaires in the Study Information system.

- One of the reasons many students drop out is that they lack a clear understanding of the study programmes and the employment opportunities in the labour market at the time they commence studies. Distribution of such information to upper secondary schools and during University admissions should be improved.
- Incoming students lack an adequate knowledge of mathematics. Mathematics courses in the study programmes should be improved, taking into account the different levels of knowledge by entrants. Theoretical subjects (mathematics, physics) should be better linked with speciality-related studies.
- Teaching staff should be actively encouraged to participate in courses relating to higher education pedagogy, by establishing relevant requirements if needed. Pedagogical courses should be mandatory for new members of the teaching staff.

### **9.2.1. ENVIRONMENTAL ENGINEERING AND MANAGEMENT (MSc)**

#### **Strengths**

- The study programme is popular. The majority of student candidates and students are from abroad. The language of instruction is English and stakeholders regard this as a clear advantage for the programme.
- The study programme provides students with broad skills in environmentally clean production and in environmental management.
- The laboratories are well equipped.
- Students are satisfied with the content of the programme as well as the distribution of the workload among different semesters.
- Group work is widely employed.
- There is a good balance between application- and theory-oriented projects.
- Teaching staff are highly qualified.
- There is a great need for graduates in the labour market and employers are pleased with them.

#### **Areas for improvement and recommendations**

- Visibility of the programme should be improved to attract more Estonian students.
- Involvement in study programme development by employers and other stakeholders should be formalised.
- International students should be offered Estonian language courses to facilitate their employment opportunities in Estonia.
- In order to expand the international dimension of the programme, more international guest lecturers should be engaged.

### **9.2.2. BIOMEDICAL ENGINEERING AND MEDICAL PHYSICS (JOINT PROGRAMME WITH THE UNIVERSITY OF TARTU, MSc); HEALTH CARE TECHNOLOGY (MSc)**

#### **Strengths**

- Both study programmes respond to the needs of industry, hospitals and health care.
- Teaching staff are qualified, ambitious and enthusiastic. The majority of the teaching staff is engaged in high-quality research and this research strongly supports teaching.
- There is a close collaboration between the teaching staff and employers (mainly from hospitals).

- There is a good balance between theoretical and experimental training in these programmes.
- Infrastructure for the Biomedical Engineering and Medical Physics programme is of high quality and fully satisfies the requirements for experimental training.
- Students are able to work on their projects in laboratories alongside doctoral students and postdoctoral researchers.
- Students highly appreciate the interaction with teaching staff. Staff members are always available to them.

#### **Areas for improvement and recommendations**

- The two fields within the Biomedical Engineering and Medical Physics programme are very different from one another and require specific approaches to teaching. The attempt to cover two different 'topics' by one study programme does not allow the programme to have sufficient focus or ensure that all the knowledge required for biomedical engineering and medical physics can be acquired. Biomedical engineering and medical physics are not in balance as topics in the programme; at present the programme seems to be more about biomedical engineering, and this is also covered better by the teaching staff. The two fields in the programme should be better integrated, focussing in particular on biomedical engineering.
- The disparate backgrounds of incoming students into the master degree programmes cause a problem that initially prevents teaching to be up to the level of a master's degree. Hence several courses in the programme are taught at the base level of bachelor degree programmes. Given it is one of the fastest developing fields globally, it is recommended that TUT launch a bachelor degree programme in biomedical engineering which would then enable the University to admit students with more uniform competence into the master's level.
- Distribution of subjects should be reviewed by semester, because master's students are of different educational backgrounds with different knowledge levels in mathematics and physics. If the University continues to admit students with different backgrounds, it needs to seek ways to level their base knowledge before starting to teach core subjects. Otherwise the danger may increase that students will drop out being dissatisfied with their studies.
- Small student admission numbers are a concern.
- The programmes should incorporate compulsory work placements in hospitals or research laboratories.
- The intended learning outcomes for both study programmes should be clarified, since at present they are too general and vague. The Health Care Technology programme is lacking a clear identity. It is critical to review its title and content and to determine which kind of specialists the graduates of the programme should become.
- Closer collaboration is needed with other structural units of TUT so that students could use the facilities of other disciplines associated with biomedical engineering (such as mechanics, materials).
- The Health Care Technology programme has an emphasis on bioinformatics and health informatics, but the Committee is of the opinion that the programme lacks resources to support such activities. On the whole, the availability of resources for this programme is unclear.
- More visiting lecturers should be invited from enterprises, the health care sector and professional associations.

- Students should be engaged in entrepreneurial activities to a greater extent, by utilising MEKTORY facilities for this purpose. Also, students could benefit from courses or seminars in management and/or entrepreneurship.
- Teaching methods for some courses need to be updated. Programme managers should have a systematic approach to this issue and also inform the students of modifications made in the programme based on student feedback.
- In the beginning of their studies in Health Care Technology, students should be offered more practical courses, and electives could be offered beginning with the second year.
- Students of the Health Care Technology programme should be offered more IT-related courses, especially since the emphasis of the programme is on health informatics.

### **9.2.3. INTEGRATED ENGINEERING (BSc); MECHATRONICS (BSc); MECHATRONICS (MSc)**

#### **Strengths**

- The e-learning works well.
- There is a close collaboration with enterprises; employers are pleased with these study programmes.
- Two programmes out of three have English as the language of instruction, there is a large proportion of international students.
- Many theses have been completed in collaboration with enterprises.
- Teaching staff are well qualified and all core members of the staff have doctoral degrees.
- Teaching staff are engaged in several projects in collaboration with enterprises.
- Students are pleased with the study programmes.
- Students have very good English skills.

#### **Areas for improvement and recommendations**

- The study programmes incorporate too many subjects with small credit values. Discussions should be initiated to integrate them into modules that have larger credit ratings.
- Marketing of the programmes should be improved to attract more and better students. At present students often have the wrong expectations regarding programmes and their contents.
- Courses in modelling and automatic control engineering should also be added to the broad programme of Integrated Engineering.
- The BSc programme in Mechatronics does not incorporate enough courses in automatic control engineering.
- The differences between these two BSc programmes should be defined more clearly. In view of decreasing student numbers, a merger of these programmes or a joint delivery of courses should be considered.
- Too few student projects in academic mechatronics are connected to University R&D activities.
- The University should provide more assistance to international students in finding internship places.
- English skills of the teaching staff should be improved. For example, a sabbatical in an English-speaking country could be beneficial, but due to large workloads, it appears that this would be difficult for the teaching staff. Participation in international conferences and sabbaticals should be given higher priority.

### **9.2.4. PRODUCT DEVELOPMENT AND PRODUCTION ENGINEERING (BSc); PRODUCT DEVELOPMENT AND PRODUCTION ENGINEERING (MSc); DESIGN AND ENGINEERING (JOINT PROGRAMME WITH THE ESTONIAN ACADEMY OF ARTS, MSc); INDUSTRIAL ENGINEERING AND MANAGEMENT (MSc)**

### **Strengths**

- Relationships among teaching staff, students and enterprises are good.
- Infrastructure is of high quality.
- Effective use of admission examinations has reduced student dropout rates.
- Teaching staff are committed, open to changes and willing to engage in personal development.
- Students are given opportunities to contribute to both course and study programme development.
- International guest students believe that the education provided is fully competitive internationally.

### **Areas for improvement and recommendations**

- Alumni should be more involved in study programme development.
- Teaching staff should be more proactive in communicating with enterprises concerning study programme development, and should also seek more ways to help working students combine their work and studies.
- Teaching staff who deliver the Design and Engineering as well as the Industrial Engineering and Management programmes should be provided with better conditions for combining their research activities with teaching, to increase the connection between the study programmes and research.
- It is necessary to stay engaged in activities that will further improve internationalisation and increase the number of international students.
- Closer collaboration among different disciplines/institutes would ensure a better use of both time and physical resources.
- Organisation of the field trips, visits to enterprises and internships needs formalisation and structuring.
- The number of international research projects should be increased.

## **9.2.5. THERMAL POWER ENGINEERING (BSc); THERMAL POWER ENGINEERING (MSc)**

### **Strengths**

- The study programmes are well structured and the learning outcomes clearly defined.
- The graduate employment rate is high.
- In their new building the Department of Thermal Engineering has very good conditions for both teaching and research.
- Close cooperation with industrial enterprises enables students to acquire good practical experiences.
- Teaching staff are highly motivated.
- During the first academic year, students are offered courses in Russian, a tutorial system, and an introduction to the speciality.

### **Areas for improvement and recommendations**

- Sources for research funding should be more diverse. Almost all national research projects are financed by industry, and the sole international project is also implemented in collaboration with industry.
- Some members of the teaching staff are not involved in any research activities and therefore teaching is not based on modern research in all courses. It should be ensured that all staff be engaged in research.

- Since all courses in the study programmes are delivered in Estonian, it is difficult to involve international students. Some courses in the programmes should be taught in English, to promote mobility of both students and staff. Teaching staff mobility is almost non-existent at present.

#### **9.2.6. FISHING AND FISH PROCESSING TECHNOLOGY (PROF HE, ESTONIAN MARITIME ACADEMY OF TUT); REFRIGERATING TECHNOLOGY (PROF HE, ESTONIAN MARITIME ACADEMY OF TUT); OPERATION AND MANAGEMENT OF MARINE DIESEL POWERPLANTS (PROF HE, ESTONIAN MARITIME ACADEMY OF TUT)**

##### **Strengths**

- These programmes are well known in Estonia and their graduates anticipated in the labour market.
- The library at the Estonian Maritime Academy is well equipped with literature in the speciality.
- Most members of the teaching staff have maritime backgrounds and professional experience in this field.
- The teaching staff who deliver the Fishing and Fish Processing Technology programme are young and highly motivated.

##### **Areas for improvement and recommendations**

- The current expected learning outcomes for the programmes should be modified since they are mainly oriented towards knowledge, not skills.
- Information about the different study programmes should be communicated in a more explicit and systematic manner.
- Interchange of information between the Estonian Maritime Academy of TUT and the University management should be improved.
- When upgrading the laboratories the needs of the Refrigerating Technology programme have not been sufficiently taken into account.
- Modern teaching methods should be used to a greater extent in teaching.
- More courses should be taught in English – an international maritime language.
- One of the reasons students drop out is their insufficient Estonian language skills. This should be taken into account when establishing admission requirements and/or appropriate Estonian-language modules should be provided in the programmes.
- Due to large workloads, teaching staff mobility is not present. For the same reason, the teaching staff are unable to use extended trainings to enhance their qualifications. There also are no international lecturers involved in the teaching.
- Particular attention should be given to ensuring the sustainability of the teaching staff; for example, it is advisable to involve alumni in teaching. It is recommended that, when planning its development activities, the Estonian Maritime Academy place more emphasis on the quality of work and personal development by its teaching staff.
- More students and alumni should be involved in study programme development.
- Students should be encouraged to participate in mobility programmes.

#### **9.2.7. MARINE ENGINEERING (PROF HE, KURESSAARE COLLEGE OF TUT)**

##### **Strengths**

- Establishment of the Small Craft Competence Centre in 2011 and its full-scale development in 2015 have provided the College with a unique technical, research and business potential, not only in Estonia but in the entire Baltic Sea region.

- The study programme is consistent with local industry needs, and generic and professional training are in good balance.
- The physical infrastructure, including laboratories, is of very good quality.
- E-learning resources are of good quality.
- Practitioners from enterprises as well as international visiting lecturers are involved in teaching.

#### **Areas for improvement and recommendations**

- Student admission numbers are small and dropout rates are high. In collaboration with enterprises, the College should more actively seek ways to prevent students from dropping out.
- Serious attention must be given to ensure that all planned lectures and seminars actually take place.
- The potential of the Small Craft Competence Centre is not fully realised. The infrastructure is underutilized, with too few students and too few R&D activities.
- The Marine Engineering programme at Kuressaare College should be made more visible to students of upper secondary schools. To this end, it is recommended that the College visit schools more often and make more effective use of multimedia channels.
- Cooperation and the flow of information between the College and enterprises should be improved, to provide information about internship places, seasonal work opportunities, and the like; for example, by establishing a virtual work forum.
- The College has the potential to set goals that are much more ambitious. The College could become a marine engineering hub for the Baltic states, Finland and Scandinavian countries. The relevant infrastructure is already present. It would be necessary to develop a study programme taught in English and to create better distance learning opportunities for practitioners in the field.
- The study programme should place more emphasis on ship design, CAD and CAM competence, and computer-based practical work.
- The study programme should incorporate more outdoor practical training. The College should have its own study ship, boat or yacht for carrying out practical work on the sea. This would help to make the programme more popular and better motivate the students. The College should improve cooperation with the Estonian Maritime Academy of TUT and the Marine Systems Institute of TUT, regarding outdoor practical training.
- Since employment opportunities are limited in Estonia, it is critical to seek new markets.
- More active participation in research projects is needed, taking full advantage of the H2020 and other European programmes.

#### **9.2.8. ELECTRICAL POWER ENGINEERING (BSc); ELECTRICAL POWER ENGINEERING (MSc)**

##### **Strengths**

- Cooperative ties with enterprises are beneficial. There are lectures at the University conducted by enterprise representatives, visits to enterprises and practical training.
- Employers consider the education to be broad based and of high quality.
- Employers are flexible, allowing students to attend lectures.
- Employers have invested in laboratory equipment.
- Students receive feedback on all their work, and their supervision is well organised.
- Students highly value the textbooks written by teaching staff.
- Teaching staff are dedicated and sufficiently qualified to teach.
- Students are motivated and highly appreciate their programmes.

##### **Areas for improvement and recommendations**

- The programmes should be better marketed, employing students and alumni as ‘ambassadors’ to the general education schools.
- Teaching of industrial standards should be included in the programmes where possible.
- The programmes should incorporate more practical/laboratory work.
- The number of students in distance learning is small, and classes conducted during evenings and weekends place a large extra load on the teaching staff. At the same time, the number of their laboratory hours is only a quarter of the hours available to full-time students. The Committee recommends that the University consult with employers and consider teaching distance-learning students in 1–2-week blocks.
- The number of courses taught in English is small. According to employers, there should be more instruction in English since the majority of professional documentation and standards are written in English.
- Due to time constraints, teaching staff have few opportunities for professional development, sabbaticals included.
- Mathematics teaching in the first academic year should be reviewed and linked to speciality needs through specific examples.
- The age structure of the teaching staff is not in balance. Recruitment and progression of the teaching staff should be given more attention at the University level.
- Research staff should be more involved in teaching.
- Teaching staff are not accustomed to visiting each other’s lectures and providing feedback. It is advisable to establish a system of staff peer mentoring to support development of the teaching staff and the entire speciality.
- The teaching laboratories need to be improved, at present there are too few workbenches and computers per student.

### **9.2.9. ELECTRICAL ENGINEERING (BSc); ELECTRICAL DRIVES AND POWER ELECTRONICS (MSc)**

#### **Strengths**

- Cooperative ties with enterprises are beneficial.
- Supervision of internships and theses is well organised and valued highly by employers.
- Research laboratories are of good quality, however the equipment is too expensive to be used by BSc students.
- MSc students are able to participate in research projects and therefore have access to research laboratories.
- Courses in the programme are regularly updated to take into account changes in the field.
- Students receive feedback on all their work.
- Teaching staff are dedicated and highly qualified. They have good relationships with students. A new generation of staff is emerging.
- All students whom the Committee met were very motivated, and valued highly the support they received from the teaching staff.

#### **Areas for improvement and recommendations**

- The BSc programme offers too few choices during the first two years. The programme should include more multidisciplinary courses.
- The number of courses taught in English is too small, their proportion should be increased (this is also the opinion of students). English is the language of R&D in industry and its use in teaching and learning would help students to acquire the pertinent technical language and terminology.
- The Mektory facilities should be better utilised.

- In cooperation with employers, efforts should be made to ensure that the majority of graduates of BSc programme could continue their studies in the MSc programme, where they acquire practical skills and knowledge, giving them better career opportunities.
- The study programmes should incorporate more practical and group work. The teaching laboratories should be better equipped.
- MSc students with experience in international study should share their experiences with other students to help increase mobility.

#### **9.2.10. DISTRIBUTED ENERGY (JOINT PROGRAMME WITH THE ESTONIAN UNIVERSITY OF LIFE SCIENCES, MSc)**

##### **Strengths**

- The study programme management is effective.
- There is a close collaboration with enterprises.
- The programme offers many choices enabling students to specialise in their preferred fields.
- International lecturers participate in the teaching, adding value to the study programme.
- Teaching staff provide students with quality feedback and full support.
- Teaching staff take into account proposals by students and employers involving changes to the programme, and implement them.
- Students are very highly motivated.
- Remedial courses are conducted to level out the expertise of incoming students.

##### **Areas for improvement and recommendations**

- The study programme should be better marketed to help increase the number of students. Current students have expressed their willingness to become ‘ambassadors’ for the programme.
- To make the study programme more attractive to specialists working in the field, various in-service training courses based on the programme should be developed and offered in evenings. This would bring in extra income for the University.
- The programme should incorporate more internship placement opportunities, and the range of internship enterprises should be widened.
- Students should be encouraged to participate in international mobility to a greater extent.
- A larger number of courses should be taught in English to attract more international students.
- The study programme should include training in computer programming and industry standard software.

#### **9.2.11. CHEMICAL AND ENVIRONMENTAL TECHNOLOGY (BSc); CHEMICAL AND ENVIRONMENTAL TECHNOLOGY (MSc)**

##### **Strengths**

- There is a good balance between theory and practice.
- Teaching staff are competent, and a sound age structure ensures adequate replacements for retiring staff. The distribution of workloads between teaching and research is flexible.

##### **Areas for improvement and recommendations**

- There should be more flexibility in the study programmes.
- To reduce the BSc student dropout rate, more speciality-related courses should be offered at the start of studies.
- The proportions of computer programming and process control should be increased in the study programmes.

- Equipment in some laboratories needs to be updated.
- The use of English in teaching should be increased to enable admission of more international students.
- The publication rate of scientific papers should be increased.
- International cooperation should be expanded by recruiting more international teaching staff, among other things.
- Practitioners from enterprises should be more involved in teaching.
- The use of sabbaticals for research should be encouraged.
- Students should be offered more opportunities and support for international mobility.

#### **9.2.12. TECHNOLOGY OF WOOD AND TEXTILE (BSc); TECHNOLOGY OF WOOD AND PLASTIC (MSc); MATERIALS AND PROCESSES FOR SUSTAINABLE ENERGETICS (JOINT PROGRAMME WITH THE UNIVERSITY OF TARTU, MSc)**

##### **Strengths**

- The study programmes are unique in Estonia and satisfy industry needs.
- Collaboration with enterprises is good.
- The MSc programmes are international and satisfy current needs of employers. Both research- and project-based teaching are employed.
- The Materials and Processes for Sustainable Energetics programme attracts many very good applicants.
- Unlike many other study programmes at TUT, dropout rates are low.
- The majority of laboratories are modern and of good quality.
- Students have access to laboratories at times outside regular laboratory class hours.
- Supervision of students is of good quality.

##### **Areas for improvement and recommendations**

- The structure of the BSc programme should be reviewed since at present the programme is too general and offers only a few choices to students. The technology of plastic is underrepresented in the study programme and could be offered as another specialisation alongside those in wood and textile technologies.
- The BSc programme is taught in Estonian only, not allowing the inclusion of international students. The Committee recommends that some sets of courses be taught in English.
- Since enterprises related to the field mainly operate in neighbouring countries, it is important for graduates to know the circumstances and environments of where they will work. Supporting this, it would also be beneficial to attract more students to the MSc programmes from the nearby countries.
- To conserve resources, collaboration with the Estonian University of Life Sciences should be improved since that university teaches in similar fields (wood technology).
- Cooperation with international universities should be intensified.
- The textile laboratories require additional investments.
- Instead of just text books, more research articles, topical research and teaching materials should be used in teaching and learning.
- Instead of just traditional lectures, more research-, problem- and project-based teaching should be employed in the BSc programme.
- There should be more visits to industrial enterprises within the framework of studies.
- The practical experiences of specialists outside the University should be employed to a greater extent in teaching. This would also help to lighten the workload of the University's teaching staff.

- In view of the age structure and large workloads of the existing teaching staff, a plan should be prepared to recruit more new staff.

### **9.2.13. FOOD ENGINEERING AND PRODUCT DEVELOPMENT (BSc); FOOD ENGINEERING AND PRODUCT DEVELOPMENT (MSc)**

#### **Strengths**

- Employers are pleased with students' broad-based education and the study programmes at TUT. Graduates of the MSc programme have no difficulty getting jobs.
- Teaching and learning conditions are good, and the laboratories are well equipped.
- Teaching staff are motivated and appreciated by students.
- Teaching staff are highly active in research and the findings of their research are published in international journals of high reputation.

#### **Areas for improvement and recommendations**

- The learning outcomes for the study programmes should be worded in greater detail. It is not clear which practical skills are expected from students completing the programmes and how those skills are assessed.
- To reduce dropout rates, students should be offered speciality-related courses alongside the generic courses at the early stages of their studies.
- The study programmes should also include computer programming, important to any engineer.

### **9.2.14. ALL PROGRAMMES OF THE STUDY PROGRAMME GROUP AT VIRUMAA COLLEGE OF TUT**

#### **Strengths**

- Graduates are highly anticipated by the labour market and their unemployment rates are low.
- Enterprises in the region have awarded students 236 scholarships over the last ten years. Enterprises also assist the College with acquisitions of equipment and text books.
- The College and its teaching staff engage in various outreach activities which ensure that students are better informed and motivated.
- Alumni conduct summer schools for upper secondary school students.
- Student counselling is effective.
- Teaching staff are committed; mentoring for staff is available.
- The facilities of the College, including laboratories, have up-to-date equipment.

#### **Areas for improvement and recommendations**

- In view of decreasing student numbers, more distance learning for working people should be offered, and more vocational school graduates should be attracted to higher education programmes.
- More students should be recruited from other regions of Estonia, but also from Ukraine and Russia, for example.
- The Oil Shale Competence Centre is an excellent asset of the College; its visibility should be improved and activities expanded internationally.
- Teaching workloads of the teaching staff are large, leaving too little time for research. The necessity for hiring more staff is felt by the teaching staff as well as by students and employers.
- The College should make academic careers more attractive to young specialists in order to ensure adequate replacements for retiring staff. To find new members for the teaching staff, more work should be done with students (directing them towards research and academic

activity) and with employers, offering them part-time positions. Staff's salaries should also be reviewed to retain the best specialists at the College.

- Students are not informed about how their feedback is used, which in turn may lead to a loss of motivation for giving feedback. More transparency is needed.

#### **9.2.15. POWER ENGINEERING (PROF HE, VIRUMAA COLLEGE OF TUT); MACHINE-BUILDING ENGINEERING (PROF HE, VIRUMAA COLLEGE OF TUT); INDUSTRIAL AUTOMATION (PROF HE, VIRUMAA COLLEGE OF TUT)**

##### **Strengths**

- There is a close collaboration with enterprises as well as with other departments of TUT. Access to laboratories at the main campus of TUT is ensured.
- When developing study programmes, the needs of industry have been taken into account.
- According to employers, the strengths of these study programmes include the close proximity of the College to industrial enterprises, the practical orientation of the programmes, the good opportunities for internships, and the teaching staff who take the interests of enterprises into account.
- Laboratory facilities are very good, many investments have been made in them. IT facilities are also extensive, and industry standard software is used in teaching.
- According to employers, graduates are well prepared for work and the well-managed internships contribute greatly to it.
- Teaching staff are active in preparing teaching materials, including e-courses, especially keeping in mind the needs of distance learning students.
- Two members of the teaching staff obtained doctoral degrees last year.
- Mentoring of new young staff is effective.
- Teaching staff and students work well together on projects such as Negavatt.
- There is close communication between the students and teaching staff; small study groups ensure individual attention and support from the staff.
- Graduates have no problems finding jobs.

##### **Areas for improvement and recommendations**

- Teaching laboratories are of very good quality, but more investment is needed in research laboratories to involve researchers in the teaching process and obtain contracts with industry. Unlike the Oil Shale Competence Centre and related specialities, opportunities for research in power engineering, machine building and industrial automation are few.
- Attention should be given to the prevention of academic fraud and appropriate software should be implemented.
- Only three staff members teach the Industrial Automation programme, and the Power Engineering programme is delivered by a teaching staff that includes only two members with master's degrees, but who are not engaged in research. Large teaching workloads are a concern.
- Future developments should be planned in consultation with alumni.
- Students are not informed about how their feedback is used, which in turn may lead to a loss of motivation for giving feedback. More transparency is needed.
- Image campaigns for the programmes should be launched to attract more young people to the College.

#### **9.2.16. FUEL TECHNOLOGY (PROF HE, VIRUMAA COLLEGE OF TUT); FUEL CHEMISTRY AND TECHNOLOGY (MSc, VIRUMAA COLLEGE OF TUT)**

##### **Strengths**

- Enterprises have awarded scholarships to students and offered short courses on specific topics, with participation by the experienced teaching staff.
- Employers value highly the practical aspects of the study programmes, which are supported by well-managed internships at local enterprises.
- The study programmes include a new module – ‘Teamwork and Management’.
- Laboratories are of very high quality and comparable to the best in Europe. Many of the laboratories have been built with support from enterprises.
- Top specialists, including from abroad, are engaged in teaching.
- A large quantity of e-learning materials is available to students.

#### **Areas for improvement and recommendations**

- Employers and students are of the opinion that, alongside fuels in the programmes, more attention should be given to a broader education in chemical engineering (particularly process engineering); more content involving automation would also be beneficial.
  - Visibility of the Oil Shale Competence Centre should be improved and its activities expanded internationally. Its facilities are underutilised at present.
  - The number of courses taught in English is small.
  - Collaboration with alumni needs more attention.
- 10.** Point 41 of the document, ‘Quality Assessment of Study Programme Groups in the First and Second Cycles of Higher Education’, 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 for improvement, and recommendations pointed out in the assessment report, and then shall decide whether to conduct the next quality assessment of that study programme group in seven years, or in less than seven years.
- 11.** The Council weighed the strengths, areas for improvement, and recommendations referred to in point 9 of this document and found that the study programmes, the teaching conducted under these programmes, and development activities regarding teaching and learning conform to the requirements if the University eliminates the following shortcomings:
- According to clause 6 (7) 1) of the Government of the Republic Regulation, ‘Standard of Higher Education’, the conduct of studies conforms to the requirements if the teaching is performed by ordinary teaching and research staff who meet the qualification requirements established in legal instruments and whose number, based on their responsibilities, loads of conducted studies and research, and numbers of students supervised, is sufficient to achieve the objectives and learning outcomes of the study programme. At Virumaa College of TUT (see point 9.2.14), excessive teaching workloads leave the teaching staff with too little time for research. Also, in view of the age structure and workload of the teaching staff, particular attention should be given to ensuring the sustainability/new generations of the teaching staff in the following study programmes: the professional higher education programmes in Fishing and Fish Processing Technology, Refrigerating Technology, and Operation and Management of Marine Diesel Powerplants (see point 9.2.6); the BSc and MSc programmes in Electrical Power Engineering (see point 9.2.8); the BSc programme in Technology of Wood and Textile, and the MSc programmes in Technology of Wood and Plastic, and Materials and Processes for Sustainable Energetics (see point 9.2.12). The shortage of teaching staff to cover the requirements of the MSc programme in Health Care Technology (see point 9.2.2.) is a concern.

- According to subsection 6 (4) of the Standard of Higher Education, the objectives and learning outcomes of a study programme must be formulated such that they provide a basis for evaluating the knowledge and skills of graduates of that study programme. The intended learning outcomes for both the MSc programme in Biomedical Engineering and Medical Physics and the MSc programme in Health Care Technology (see point 9.2.2) are too general and vague and need to be made specific. The intended learning outcomes for the BSc and MSc programmes in Food Engineering and Product Development (see point 9.2.13), and for the professional higher education programmes in Fishing and Fish Processing Technology, Refrigerating Technology, Operation and Management of Marine Diesel Powerplants (see point 9.2.6) are not clear as to which practical skills are expected from students completing the programmes and how those skills are assessed. The learning outcomes for professional higher education programmes at the Estonian Marine Academy of TUT should be modified since at present they are mainly oriented towards knowledge, not skills.
- In addition, the Council considers it necessary to draw attention to the following general areas for improvement within the study programme group:
  - o In the first two years of bachelor degree programmes, the students have too few choices, the programmes should be of a more multidisciplinary character. A trend should be established towards offering more broad-based bachelor degree programmes.
  - o Admission requirements should be defined more clearly for master degree programmes, and the different levels of prior education of incoming students should be taken into account when organising the studies. Students from other study programmes often lack the backgrounds required for a specific master degree programme.

**12.** According to clause 53 (1) 2) of the Administrative Procedure Act, a secondary condition of an administrative act is an additional duty related to the principal regulation of the administrative act, and according to clause 53 (1) 3) it is also a supplementary condition for the creation of a right arising from the principal regulation of the administrative act. Clauses 53 (2) 2) and 3) establish that a secondary condition may be imposed on an administrative act if the administrative act cannot be issued without the secondary condition, or if issue of the administrative act must be resolved on the basis of an administrative right of discretion. The Council found that, without a secondary condition, the next quality assessment of the study programme group should be conducted in less than seven years, and

#### **DECIDED**

**to approve the assessment reports and to conduct the next quality assessment of the Engineering, Manufacturing and Technology study programme group in the first and second cycles of higher education at Tallinn University of Technology in seven years with the following secondary condition:**

No later than 28.03.2018, Tallinn University of Technology shall submit an action plan and a progress report to the Council on eliminating the shortcomings referred to in point 11 of this document.

The decision was adopted by 9 votes in favour. Against 0.

- 13.** In case Tallinn University of Technology does not comply with the secondary condition by the due date, the Council will repeal this assessment decision and set a new date for a quality assessment of the study programme group, or establish a new secondary condition.

- 14.** A person who finds that his or her rights are violated or his or her freedoms are 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. A judicial challenge to the decision may be submitted within 30 days after its delivery, filing an action with the Tallinn courthouse of the Tallinn Administrative Court pursuant to the procedure provided for in the Code of Administrative Court Procedure.

**Tõnu Meidla**  
Chair of the Council

**Hillar Bauman**  
Secretary of the Council