ESTONIAN QUALITY AGENCY
FOR HIGHER AND VOCATIONAL EDUCATION

Assessment Report

Building

Tallinn University of Technology

Estonian University of Life Sciences

TTK University of Applied Sciences

2017

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Introduction

Quality assessment of a study programme group involves the assessment of the conformity of study programmes, the studies and development activities that take place in respect of legislation, national and international standards and developmental directions with the purpose of providing recommendations to improve the quality of studies.

The goal of quality assessment of a study programme group is supporting the internal evaluation and self-development of the institution of higher education. Quality assessment of study programme groups is not followed by sanctions: expert assessments should be considered recommendations.

Quality assessment of a study programme group takes place at least once every 7 years based on the regulation approved by EKKA Quality Assessment Council for Higher Education *Quality Assessment of Study Programme Groups in the First and Second Cycles of Higher Education*.

The aim of the assessment team was the evaluation of the Building Study Programmes within the Architecture and Building Study Programme Group (SPG) in three universities –Tallinn University of Technology (TUT), Estonian University of Life Sciences (EMÜ) and TTK University of Applied Sciences.

The team was tasked with the assessment of the conformity of the study programmes belonging to the study programme group and the instruction provided on the basis thereof to legislation and to national and international standards and/or recommendations, including the assessment of the level of the corresponding theoretical and practical instruction, the research and pedagogical qualification of the teaching staff and research staff, and the sufficiency of resources for the provision of instruction.

The following persons formed the assessment team:

Mark G Richardson (Chair)	Deputy Vice President for Global Engagement, University College Dublin (Ireland)
Juris Rihards Naudžuns	Professor, Riga Technical University (Latvia)
Paul Rullmann	Chairman of SURF the Collaborative organisation for ICT in Dutch education and research (The Netherlands)
Philippe Bouillard	Professor, Université Libre de Bruxelles (Belgium)
Hermann Blum	Student, ETH Zürich, ESU (Switzerland)
Tiit Kerem	CEO, AS Telora-E (Estonia)

The assessment process was coordinated by Liia Lauri (EKKA).

After the preparation phase, the work of the assessment team in Estonia started on Monday, March 13, 2017, with an introduction to the Higher Education System as well as the assessment procedure by EKKA, the Estonian Quality assurance organization for higher and vocational education. The members of the team agreed the overall questions and areas to discuss with each group at the three institutions, who were part of the assessment process. The distribution of tasks between the members of the assessment team was organised and the detailed schedule of the site visits agreed.

During the following days, meetings were held with the representatives of Tallinn University of Technology (March 14th), TTK University of Applied Sciences (March 15th), and Estonian University of Life Sciences (March 16th). The meetings included opportunity for discussion with university management, deans and department heads, programme leaders, academic staff, students, alumni and employers. Initial findings were reviewed by team members prior to departure from each location, each day.

On Friday, March 17th, the 'Building' review panel held a joint half-day meeting with the 'Architecture' review panel to explore common overall findings in the 'Architecture and Building' study programme group (SPG) assessments. The output of these discussions informed the writing of parts of the respective reports. Separate meetings were held in the afternoon, during which the 'Building' review panel agreed the structure of the final report and the findings were discussed and collated. This work was executed in a cooperative way and the members of the team intensively discussed their individual views on the relevant topics.

In the following sections, the assessment team summarise their general findings, conclusions and recommendations which are relevant across the whole SPG. The team provides an external and objective perspective on the programmes and the contexts within which they are delivered. The intention is to provide constructive comment and critique which may form the basis upon which improvements in the quality of the programmes may be achieved.

General findings and recommendations

The findings were informed by the self-evaluation reports and evidence gathered during site visits. In all but one of the institutions, students were not directly involved in the compilation of the self-evaluation report. **The involvement of students in the preparation of Self-Evaluation Reports is best practice and is recommended.**

The Assessment Team noted the high quality of infrastructure in place to support the programmes, particularly the good laboratory facilities and libraries (with online access to international databases). In addition the very strong connection and supportive collaboration with industrial partners forms a good foundation from which to leverage the full potential of third level education in serving the future needs of Estonian society and the further development of its economy. The demographics at present indicate reduced competition from Estonian school leavers for places in third level programmes but the State is not using this as an opportunity to reduce its investment in third level education. Building on these strong pillars the Assessment Team identified areas where targeted action and resources could assist in the quality of programmes within the institutions and study programmes assessed.

The national higher level education landscape

The demographics of Estonia presents a stark picture in respect of future demand for admission to higher level education. There will be a continuation of the progressive decline in the number of students completing their second level studies for some years to come. Despite the demographics, the state support for higher education is not diminishing. However further measures are being introduced to assure an equitable return on this investment for the Estonian economy and society. Higher education programmes may only be provided if the quality of a Study Programme Group (SPG) has been assessed and the Government has granted a license to provide instruction in that SPG. Operational support is divided into baseline funding (at least 80%) and performance funding (up to 20%). The performance funding is based on performance indicators and a performance agreement signed with the Ministry of Education and Research. The basis for state-funded student places has also been modified.

There are two types of higher education institutions in Estonia, which each may be either public or private. These two types are universities (currently 6 public) and professional higher education institutions (currently 8 public). Research-intensive universities provide bachelor's, master's and doctoral programmes, but may also offer professional higher education programmes. Professional higher education institutions, promoting lifelong learning responsive to the needs of the labour market and conducting applied research, offer professional higher education and may also provide master's programmes. The number of higher education institutions in Estonia (public and private) peaked in 2001 but has progressively declined since then, primarily through closures in the private sector. The number of public universities and professional higher education

institutions has remained stable over the period despite the demographic and financial pressures. This review was conducted on programmes delivered by TUT, TTK and EMÜ, all of which are public institutions.

The requirement for access to higher education is secondary education. A higher education institution may introduce further admission requirements, such as minimum scores of national examinations, but clearly there will be a reluctance by any single institution to place barriers to entry, compared to their competitors, at a time of ever-reducing demand.

The Assessment Teams for both the 'Architecture' and 'Building' SPG have noted that the country has been going through a demographic change and a decline in the population. This will be reflected in student numbers for some time during the coming years. There is a threat of too few students in a class. To obtain the critical amount of good students Estonia should reconsider how the programmes are run effectively and competitively, how the achieved high quality can be maintained. Is there a need for consolidation of different programmes, as well as consolidation within the programmes?

The Assessment Teams for both the 'Architecture' and 'Building' SPG share the view that in the rapidly changing world it would be useful to seek for cross-disciplinary collaboration, especially between building and architecture, but perhaps also with other universities. In the everyday learning environment, the approach seemed to be, if not absent, at least not widely utilized.

The Assessment Team were mindful of these interconnected factors (governmental, institutional and student-centred) as it framed its recommendations. The Assessment Team sincerely trusts that it has framed its recommendations in the best interests of the quality of higher level education, as a servant of both society and the Estonian economy.

Taking account of these multi-faceted factors, the Assessment Team **recommends that the level of co-operation between 'Architecture and Building' cognate study field departments of the various universities and professional higher education institution in Estonia be significantly improved. The collaborative arrangements should target the deployment of scarce resources in a manner that would allow the 'Architecture and Building' SPG to survive and flourish at national level, through the particular strengths articulated in the vision and mission statements of each institution.** The Assessment Team cannot over-emphasise the potential long-term benefits to Estonian higher education of economy of scale and the focusing of scarce resources in selected centres of excellence, identified from existing or newly integrated academic units. Regarding consolidation, the Assessment Team would respectfully point out that the competitive challenge is not a matter of competition between the higher education institutions within Estonia – the challenge is between the best that Estonian higher education can offer and the rest of the world. This requires partnerships at the highest levels.

Particular challenges facing engineering education

The challenge for Estonian higher education institutions to fill currently-available programme places with capable and motivated students, against the stark demographic trends, is further exacerbated in the 'Architecture and Building' SPG by a European trend of fall-off in interest by school leavers in science and engineering programmes. This comes on top of a pre-existing problem of stereotypes and mind-sets which has hindered women's participation in engineering studies. Failure to address this European (and worldwide) fall-off in interest by school leavers will present particularly serious problems in Estonia. This is because the very low numbers now graduating from many programmes must place these programmes' viability in doubt. Progressive closure of engineering programmes below a certain level would further hinder the future provision of indigenous professionals to underpin the development of the physical environment required for Estonia's economy to flourish. However the viability of programmes cannot be assumed – action is required to increase admission and retention rates.

The key is to challenge any inaccurate messages that are influencing persuasive voices in the secondary schools (career guidance counsellors) and in the home (parents), at critical stages in the school leavers decision-making window. The Assessment Team **recommends that, informed by practice in universities throughout the world who face similar challenges, the institutions professionalise the marketing of the programmes: better information; promote the education and professional life of civil and environmental engineers in a more attractive light; challenge mind-sets that reduce female applications and retention, especially in civil engineering programmes.**

Addressing the needs of today's learners

The external environment in which current students at second and third level live and study has changed significantly over the last decade. The primary change has been in the ease of access to information sources through developments in information technology, notably mobile devices. This has had a profound impact on the approach of many students to their education. Due to the number and diversity of information sources, the training and development of critical thinking skills is more important than heretofore. Today's educators must respond to the new challenge, irrespective of their record of achievement and hard-won experience as gifted educators to date using traditional approaches.

The Assessment Team noted that the infrastructure required and awareness of developments of student-centred learning approaches was present but that its deployment was patchy. Regarding the knowledge and skills necessary to embrace more student-centred learning approaches the institutions are providing the possibilities. However the Assessment Team found that there was too much reliance on an individual initiative or voluntary participation in pedagogical upskilling. Mindful of the urgency in addressing the sustainability of programmes,

through increasing admission rates and reducing drop-out rates, the Assessment Team **recommends that each institution develop a policy regarding pedagogical training for all academic staff and mandatory pedagogical leadership training for those taking on programme co-ordinator roles. This should be supported by a once-off curriculum review enhancement project, requiring module descriptors to be updated to ensure module delivery and assessment using contemporary student-centred learning approaches**. The needs of student-centred learning may require early interventions in existing infrastructure such as extending the opening hours of libraries to offer more flexible learning conditions.

Internationalisation – opportunity or challenge?

The current period of over-capacity in Estonian higher level institutions due to the demographic situation presents an excellent opportunity to accommodate the demand from international students to gain some or all of their education in an international context. This cannot however take place in an atmosphere where international students are primarily regarded by some stakeholders as revenue generators until the national demand recovers in Academic Year 2022/2023. Internationalisation must be seen as a win-win for all stakeholders and with international students contributing strongly to the community of the institution. Equally internationalisation must embrace a strong commitment to support outward mobility by Estonian students and staff.

The Assessment Teams for both the 'Architecture' and 'Building' SPG have noted that there are still problems in the international exchange of students and teachers. The transfer of credits may be sometimes a problem in mobility. This should be corrected. Also, the courses taught in English are still too few.

The Assessment Team were concerned at the perceived lack of priority afforded to internationalisation among some stakeholders. This was evident in the barriers to ease of credit transfer by Estonian students who engage in Erasmus exchange and in the very modest levels of international student recruitment activity envisaged by some programme co-ordinators. A bolder approach is required, including reducing the barriers to inward mobility caused by offering programmes at master's degree level solely in the Estonian language.

The Assessment Team **recommends that each institution draws up an action plan on significantly increasing internationalisation. This should include, but not be limited to:** making the outgoing exchange easier (full credit transfer avoiding extending study duration); introduction of courses on English for Academic Purposes; development of alternative mobility paths (shorter stays, internships); involvement of employers in making the mobility exchange possible while combining studies with a part-time job; improvement of international student attractiveness to Estonian institutions (develop programmes in English).

Research-informed education

A key feature of third level education is the dynamic nature of the research activity in the institution at the time when a cohort of students is progressing through. The synergy between live research projects – especially externally-generated projects - and student engagement in this activity is an integral part of their research-informed education. The Assessment Team members were somewhat disappointed at the level of this activity in some programmes. **The Assessment Team recommends that the level of research exposure be increased through greater integration of students into research projects.** A possible difficulty in this regard was noted, in that competition between institutions for limited state research grants could lead to problems of continuity in research project availability in any one institution. Here again the benefits of a collaborative approach among the institutions is highlighted, with each playing to their particular infrastructural strengths and mission.

The drop-out rate problem

The demographics of Estonia at present has led to a progressive decline in the pool of available applicants for admission to higher level programmes, not least in the 'Architecture and Building' SPG. State support for higher education is crucial, as is an equitable return on this investment for Estonian society and the economy. Whatever about the challenge of admission numbers, the drop-out rate is shocking by international standards. The Assessment Team found it to be so widespread across programmes and institutions that it is clearly a national systematic problem. Individual programme leaders and the senior management of individual institutions have introduced local measures to ameliorate the drop-out rate but cannot solve this national problem alone, on a programme-by-programme basis.

The Assessment Team learned of a variety of current solutions but that none had been completely successful so far. The Assessment Team noted that the financial consequences are not penal for a student who drops out more than once, even from attempts at different uncompleted programmes. This may encourage 'shopping around' by individuals without strong motivation and should be discouraged. The Assessment Team detected that some students undervalue third level qualifications and drop out as soon as regular employment is attainable. Their employers are not doing themselves or such employees any long-term favours by encouraging this short-term gain approach. The association of third level education solely with 'training for initial employment' rather than 'education for life' was a disturbing impression gained from some of the Team's dialogue with representative groups. Such systematic problems must be identified, analysed accurately and addressed in a unified approach. The Assessment Team **recommends that a twin track approach be undertaken at national level and at programme level:**

(i) At national level the Ministry, the universities, professional higher education institutions and employers' representative bodies should work collectively to identify, analyse and agree the primary systematic causal factors and collective action to address the drop-out culture.

(ii) In parallel, at programme level, ongoing efforts should be redoubled to prioritise retention action plans that could include better and more accurate career information in secondary schools; introduction of engineering subjects in the first years; revision of the learning outcomes of core mathematics and physics modules to make them more engineering focused; appointment of the best teachers to take the first year modules; leveraging maximum benefit of e-learning at first year level; improving student-centred learning; provision of early training in time management for those in part-time employment; proactive academic mentorship and individual progression follow-up; building community at staff and student level from first year level (sense of belonging and responsibility) and improve pedagogical coordination.

Staff development

The Assessment Team noted the complexity of financing the third level education sector and distributing resources in a manner that encourages achievement of strategic objectives. A concern was the effect of financial instruments in distorting the balance of staff development in excellence of their teaching and research. The Assessment Team found evidence among academic staff that rewards – both in current salary policy and recognition of professional excellence – were perceived as an encouragement to prioritise research while possibly neglecting excellence in their teaching profile. The Assessment Team **recommends that clear staff development policies be articulated by each institution, underpinned by firm affirmations of the institution's sense of value, expectations and rewards in respect of high quality teaching, reflected in the selection and promotion criteria.** The importance of this in respect of the sustainability of the 'Building' programmes of the 'Architecture and Building' SPG should not be underestimated, due to the role of well-informed curriculum reform, e-learning oversight and inspirational lecturers in the attraction and retention of students.

1. Assessment report of SPG at Tallinn University of Technology

1.1. Introduction

The formation of Tallinn University of Technology (TUT) can be traced back to 17 September 1918 when the Estonian Engineering Society opened an engineering school called 'Special Engineering.' Qualification of the university was granted to 'Tallinn University of Technology' in 1936. The status of a university, in public law, was granted on 12 January 1995 by the Universities Act.

In Estonia, TUT is recognized as a research university, providing research-based education, accountable for the new generation of engineers, the spirit and quality of engineering culture in Estonia, promoting sustainable development of the society and growth of national welfare by the innovative services. TUT provides opportunities for acquisition of higher education in line with developments in science and technology at all cycles in the areas of natural and exact sciences, engineering, manufacturing and technology, social sciences and in related areas. TUT fosters R&D in these areas, at the same time creating a synergy between different fields and areas.

According to the performance agreement between TUT and the Ministry of Education and Research, TUT is responsible for the teaching and development of the programmes in the field of Architecture and Building. The 'Architecture and Building' SPG at TUT consists of 11 curricula (2 PHE, 1 BA, 4 INT and 4 MA programmes). This report evaluates 5 curricula (3 INT and 2 MA programmes) in the 'Building' classification. The study programmes of Architecture are evaluated within a separate assessment report.

There are 11,494 students studying in TUT (01.10.2016), including 1,083 students in the study programmes of 'Architecture and Building' SPG. The statistical data on the student numbers concerning Building study programmes evaluated in this report are presented in Table 1.

TABLE 1. Statistical data of the Building Study programmes within the Architecture and Building Study Programme Group at Tallinn University of Technology

Title of study programme		Academic year				
		2016 /17	2015 /16	2014 /15	2013 /14	2012 /13
Environmental Engineering (INT)	No of students	119	157	187	196	262
	No of admission	29	30	36	9	66
	No of drop-outs		20	31	20	42
	No of graduates		19	24	14	23
Road Engineering and Geodesy (INT)	No of students	94	108	141	172	206
	No of admission	15	23	22	21	39
	No of drop-outs		17	27	28	29
	No of graduates		13	33	27	23
Civil and Building Engineering (INT)	No of students	420	528	615	727	797
	No of admission	116	96	78	102	169
	No of drop-outs		38	95	122	108
	No of graduates		49	65	57	71
Energy Efficiency of Buildings (MA)	No of students	26	30	34	38	34
	No of admission	9	18	15	19	15
	No of drop-outs		9	11	11	6
	No of graduates		5	12	11	8
Building and Infrastructure Engineering (MA)	No of students	74	39			
	No of admission	45	41			
	No of drop-outs		8	3		
	No of graduates		1			

Source: Self-Assessment Report of Tallinn University of Technology (2016)

1.2. General findings and recommendations at the study programme group level

The Assessment Team commend the University on the quality of the Self-Evaluation Report in identifying the challenges facing the study programme group. Less evident however was the articulation in the Report of measures to address the challenges. More disturbingly, the Assessment Team were disappointed during the site visit at the lack of a sense of ownership of the challenges. This lack in 'ownership' naturally precluded evidence of a readiness by stakeholders to take the bold steps necessary to address the challenges and opportunities. It is **recommended that any sense of a loss of empowerment by individual staff members in their role in delivering high quality programmes be assessed and reversed if necessary**.

The lack of a sense of ownership appears to be related to current reform of the organisational structure within the University. The Assessment Team found it difficult to clarify with staff and students their understanding of 'who was responsible for what'. For example the role and responsibilities of 'research group leaders' versus 'programme leaders' is not self-evident and the titles may convey an impression of prioritising research above teaching, rather than these being equal parts of the mission of a research-intensive university. The Assessment Team appreciate the magnitude of the task on senior management to ensure that TUT has a strategy to enhance its competitive position in world rankings of research-intensive universities. Nevertheless concern must be expressed at the level of 'buy-in' achieved to date with the strategy and the negative impact this may have on the study programmes. **Better communication of the institutional strategy underpinning the organisational structure reforms is recommended, especially the concept behind study programmes being led by 'research group' leaders, to ensure that there is no perceived loss of institutional prioritisation on the student being at the heart of its mission.**

Many commendable aspects were identified in respect of the quality and coherence of programmes, underpinned by good facilities and highly-skilled teachers. Developments in e-learning, supported by an excellent educational technologist team were noteworthy. Several laboratories are accredited test laboratories, ensuring regular links between the University and industry. The interaction with industry through these accredited laboratories is very valuable and it is **recommended that these industry links should be leveraged to get greater commitment by industry to support TUT programmes in the form of practical training during the programmes**.

The Assessment Team noted that learning outcomes are defined at the module level only. The learning outcomes in the study information system are very general and some appear outdated. As learning outcomes are the backbone of a curriculum and an important guide for students to create their learning paths, **it is recommended that a curriculum review would be conducted to define**

programme outcomes, against which the coherence of module learning outcomes could be verified, or revised where necessary.

It was not clear how academic staff collectively reviewed the trends in the results of examinations per module, nor the overall performance of a student and the resultant academic guidance to be provided to weaker candidates. **It is recommended that consideration be given to the formation of an Examination Review Board per suite of cognate programmes** for this purpose.

It was noted that there exists an active student union that organizes student's involvement in the management of the university. Equally there is provision for external representatives on the Study Programme Committee. However the purely advisory nature of the committee could lead to a lack of stakeholders' engagement over time. Participation by stakeholders is deserving of an effective feedback loop demonstrating that their input is acted upon. **It is recommended that a more proactive approach be taken to engaging stakeholders in ongoing study programme enhancement and delivery.**

The potential for fraud during assessment exists in the current practice of reliance on local arrangements for organisation of written examinations. In addition, lecturers are placed in a difficult position if they have discretion at local level to deal with substantial cases of plagiarism in coursework submissions or attempts to cheat at written examinations. **It is recommended that end of semester examinations be administered on an institution-wide basis, independent of departments,** with adequate numbers of invigilators working to standard published procedures. **It is recommended where *prima facie* evidence of cheating exists, either in written examinations or in coursework, that strict enforcement of the academic misconduct policy be at institutional (and not departmental or lecturer) level.** The discretionary powers at lecturer level could be reintroduced when sufficient data exists to demonstrate that the culture of tolerating fraud by classmates is no longer a feature of student 'group-think'.

The Assessment Team formed the impression that a sizeable proportion of students had a low motivation to educate themselves, but rather wanted to get through their studies as quickly as possible in order to get a job. **It is recommended that a range of measures be introduced to change this culture through making students more aware of the lifelong value of 'education' versus 'training' and the responsibilities and rewards of being a professional.** This would include emphasis on the necessity for a fundamental engineering education in developing the professional competence to meet future challenges.

1.3. Strengths and areas for improvement of study programmes by assessment areas

1.3.1. Civil Engineering (INT), Building and Infrastructure Engineering (M)

Study programme and study programme development

Standards

- ✓ The launch or development of the study programme is based on the Standard of Higher Education and other legislation, development plans, analyses (including labour market and feasibility analyses), and professional standards; and the best quality is being sought.
- ✓ The structure and content of modules and courses in a study programme support achievement of the objectives and designed learning outcomes of the study programme.
- ✓ Different parts of the study programme form a coherent whole.
- ✓ The study programme includes practical training, the content and scope of which are based on the planned learning outcomes of the study programme.
- ✓ The study programme development takes into account feedback from students, employers, alumni and other stakeholders.

Comments

The **Master in Civil (and Building) Engineering** is an integrated 5-year programme (300 credits). It has been developed in 2002 and last revised in 2015. It gives access to possible continuing PhD studies or to certification as an engineer by Estonian Professional Societies after 2 years of relevant experience. It corresponds to a level 7 in the Estonian/European Qualification Framework.

The aim of the programme is to train engineers for the construction industry in Estonia. It offers 3 areas of specialisation in Tallinn: (*i*) Construction engineering (*ii*) Construction management and economics and (*iii*) Coastal engineering and harbour construction. Since 2012, the programme is also delivered in the College of Tartu with 2 specialisations: (*i*) Building restoration and (*ii*) Building design and architecture.

The programme includes transversal modules (35 credits), basic modules (55 credits), core modules (74 credits), advanced modules (94 credits), electives (12 credits) and a graduation thesis (30 credits).

The structure is the same in both locations and learning outcomes have been coordinated. Unfortunately, the Assessment Team did not have the opportunity to have time on site in Tartu College and this report will not refer to the programmes in Tartu anymore.

The **Master in Building and Infrastructure Engineering** is a 2-year programme (120 credits) and was launched in 2015 to offer bachelor graduates with a professional degree to continue their studies in a master. The programme offers seven study tracks: engineering survey, construction management and economics, construction engineering, heating and ventilation, bridge engineering, road engineering, water engineering. One more study track is considered to be added soon focusing on energy efficiency of buildings. The programme corresponds to a level 7 in the Estonian/European Qualification Framework.

The programme includes basic modules (15 credits), advanced modules (70 credits), elective modules (5 credits) and a graduation thesis (30 credits). It has to be noted that the master programme is actually relying on existing modules offered in the integrated 5-year programme.

Both programmes comply with TUT internal regulations. A study programme committee including stakeholders' representatives (employers and students) has been gathered to coordinate regular reviews of the programme and advise the department about possible improvements.

Strengths

- The modules clearly support the achievement of the programmes aims and learning outcomes in a coherent way. No major overlap or gap between courses has been identified and the sequence of courses appears to be logical.
- The study programmes development clearly takes feedback from students and employers into account.
- In particular, the study programmes have been upgraded to match the recent trends in digitalisation in the construction industry by offering courses on BIM.
- The 5-year programme includes modules of transversal competences (35 ECTS) in foreign languages, communication and socio-economical sciences.
- The 2-year master programme is highly relevant to offer further master studies for graduates with a professional degree and is not duplicated modules by taking benefit of the 5-year integrated programme offer.

Areas of improvement and recommendations

- In order to improve the learning experience, it is recommended to introduce more active learning activities including teamwork and projects.
- In order to improve student mentoring and advising, it is recommended to gather an Exam Board, or equivalent, to monitor, analyse and report on students' progress and completion.
- In order to foster international mobility in both directions, modules should be offered in English as the foreign language is one of the main identified barrier.
- The number of electives (12 credits in the integrated 5-year programme or 5 credits in the master programme) appears to be scarce and it is recommended to consider increasing the elective opportunities.
- Regarding the high potential of the 2-year master programme to attached bachelor graduates, it is recommended to better elucidate the admission requirements and develop possibilities additional modules to cover the prerequisites.

Resources

Standards

- ✓ Resources (teaching and learning environments, teaching materials, teaching aids and equipment, premises, financial resources) support the achievement of objectives in the study programme.
- ✓ There is a sufficient supply of textbooks and other teaching aids and they are available.
- ✓ Adequacy of resources is ensured for changing circumstances (change in student numbers, etc.).
- ✓ Resource development is sustainable.

Comments

The programmes are delivered in the Mustamäe Campus, third block, which has been renovated in 2006. The building has 18 lecture rooms and sufficient place for laboratories. Other laboratories are available in the campus. A specific computer room of 15 seats is also available in the building. TUT is member of HITSA (Information Technology Foundation for Education) network which gives access to the online course management system Moodle which is an international standard in this regard. TUT has a modern library containing a sufficient number of books and online resources. Scheduling is organising centrally by the Office of Academic Affairs and seems satisfactory both for students and lecturers.

Strengths

- The library provides the students and the staff with sufficient number of books and online resources, both in Estonian and foreign language.
- The development of use of online module management system (Moodle) is ongoing and supported by a very qualified team of educational technologists.
- Each subject has an academic coordinator in charge of resources as well.

Areas of improvement and recommendations

- Though the laboratory equipment is adequate and operational, it is recommended to elaborate a plan for upgrading to allow the students to be confronted to modern technologies.
- The same issue arises for the computer room where a renewal should be urgently planned.
- There has been repeated complaints about heating and ventilation deficiencies in the building which have not been properly addressed yet and it is recommended to plan appropriate solutions.
- TUT is planning to launch their own online platform but should consider this very carefully, ensuring that they continue benefiting from the HITSA network.

Teaching and learning

Standards

- ✓ The process of teaching and learning supports learners' individual and social development.
- ✓ The process of teaching and learning is flexible, takes into account the specifics of the form of study and facilitates the achievement of planned learning outcomes.
- ✓ Teaching methods and tools used in teaching are modern, effective and support the development of digital culture.
- ✓ Practical and theoretical studies are interconnected.
- ✓ The organisation and the content of practical training support achievement of planned learning outcomes and meet the needs of the stakeholders.

  The process of teaching and learning supports learning mobility.
- ✓ Assessment of learning outcomes is appropriate, transparent and objective, and supports the development of learners.

Comments

The teaching and learning process is governed by TUT Academic Policies. Descriptor are available for every module clearly stating the learning outcomes, methods and assessment. The student workload is regulated with 26 academic hours per credit, with a maximum of half of these being contact hours. This workload is regularly reviewed based on students' feedback. Internships are scheduled in the 5-year study programme after 3rd and 4th year with a duration of 5 and 6 weeks respectively (3 and 4 credits respectively). Recognition for prior learning and work experience is regulated but the Review Team could not find any evidence of implementation. Academic fraud is regulated by the TUT Academic Policies but as already mentioned is still a concern. The self-evaluation report mentions that studying abroad (Erasmus exchange) is possible with a full credit transfer but this has been contradicted during the visit.

Strengths

- The teaching and learning process clearly supports the learners' individual development and facilitates the achievement of the expected learning outcomes once the specialisation has been chosen.
- The objective to offer an e-version of each compulsory course by 2020 is very valuable and training sessions are available to support the staff.
- The master theses made available during the site visit demonstrate a very good level of research, including international literature review and citation.
- The teaching workload for the students is meeting the international standards for such a programme.

Areas of improvement and recommendations

- The practical training objectives during the internships in the 5-year integrated programme are currently limited to 7 ECTS and gaining professional experience only. It is recommended to increase the credits dedicated to internships and better integrate them into the programme by defining clear learning outcomes and offering academic supervision.
- Similarly, an internship should be integrated in the 2-year master programme.
- The process of teaching and learning does not currently support international mobility. It is recommended to improve the credit transfer system avoiding to extend the duration of studies.
- During the interview with the students, it appears that their exposure and participation to ongoing research projects could be significantly improved in order to develop their skills with that regard.

Teaching staff

Standards

- ✓ There is teaching staff with adequate qualifications to achieve the objectives and planned learning outcomes of the study programme, and to ensure quality and sustainability of the teaching and learning.
- ✓ Overall student assessment on teaching skills of the teaching staff is positive.
- ✓ The teaching staff collaborate in the fields of teaching and research within the higher education institution and with partners outside of the higher education institution (practitioners in their fields, employers, and staff members at other Estonian or foreign higher education institutions).
- ✓ Recognised foreign and visiting members of the teaching staff and practitioners participate in teaching the study programme.

  The teaching staff is routinely engaged in professional and teaching-skills development.
- ✓ Assessment of the work by members of the teaching staff (including staff evaluation) takes into account the quality of their teaching as well as of their research, development and creative work, including development of their teaching skills, and their international mobility.

Comments

TUT Personnel Strategy has defined the objectives for qualifications required of the teaching staff. The self-evaluation report states that teaching staff are required to be professional, active internationally in the subject field and able to work in the international environment. These objectives are met by the department and TUT is also providing continuing professional development training courses for the academic staff. Participation in these courses however is not made compulsory. The student feedback in the department is very positive, with a mean grade of 4,41 out of 5. Most of the staff is engaged in research. The current composition of the department of Structural Design is: 2 professors, 3 associate professors, 3 lecturers, and 6 doctoral students; the Department of Building Production: 2 professors, 2 associate professors and 3 lecturers; the Department of Technology: one professor, 3 associate professors, 3 lecturers and 2 doctoral students.

Strengths

- The teaching staff has adequate qualifications to deliver the programmes learning outcomes and their teaching ability is highly appreciated by the students.
- Some staff are involved in collaborative international research projects and take benefit of international mobility periods.
- The participation of practitioners in the programmes delivery is adequate.

Areas of improvement and recommendations

- The ratio between the number of staff and students meet international standards but the workload balance is not. The teaching workload is high and needs to be monitored to allow some space for research and personal development.
- The level of collaboration within the university with closely related departments, like Tartu College, is rather limited and should be significantly improved.
- Staff development training are made available, particularly for young staff members but the teaching staff is not routinely engaged in professional and teaching-skills development. It is recommended to better assess the teaching performances and teaching staff engagement in self-development as part of the promotion criteria.
- The involvement of visiting guest lecturers from other Estonian or international higher education institutions should be further developed and integrated in the programme.
- A better attention should be paid in attracting and recruiting PhD students in each department.

Students

Standards

Student places are filled with motivated and capable students.

The dropout rate is low; the proportion of students graduating within the standard period of study is large.

✓ Students are motivated to learn and their satisfaction with the content, form and methods of their studies is high.

As part of their studies, students attend other Estonian and/or foreign higher education institutions as visiting or international students.

✓ Employment rate of alumni is high.

✓ Alumni and their employers are pleased with their professional preparation and social competencies.

Comments

The Assessment Team found that there is a lot of entry competition into the programmes. Students who enter the first semester are provided with a lot of information and there is a good induction programme.

Regarding the **Master in Civil (and Building) Engineering** programme, the drop-out rate is 7% with regard to the total number of students and 40% with regard to the size of a single year's class (528 students, 96 admissions, 38 dropouts).

Regarding the **Master in Building and Infrastructure Engineering** the drop-out rate is 20% with regard to the total number of students and 20% with regard to the size of a single year's class (39 students, 41 admissions, 8 dropouts).

Only 1% of students use the possibility to study abroad. There are no exchange students coming in to these programmes.

Strengths

- The satisfaction of employers has been verified by a scientific study.
- In the **Master in Building and Infrastructure Engineering** programme, some students make use of internships abroad. The Assessment Team regards this as a very positive way for those who need employment, as a way of financing their living costs, to achieve an international experience as part of their studies.

Areas of improvement and recommendations

- The self-evaluation report states that mobility programmes are used by the students extensively. Based on the given numbers, the Assessment Team has reached a very different conclusion and would like to emphasize the general recommendations on student mobility.
- Job opportunities in the field of Building and Infrastructure Engineering are too readily available for those who have yet to complete their engineering education to master's degree level. This contributes to the high drop-out, wasteful of resources across the sector. Collaboration between institutions on specialisations at master's degree level would help to match supply and demand.

1.3.2. Road Engineering and Geodesy (INT)

Study programme and study programme development

Standards

- ✓ The launch or development of the study programme is based on the Standard of Higher Education and other legislation, development plans, analyses (including labour market and feasibility analyses), and professional standards; and the best quality is being sought.
- ✓ The structure and content of modules and courses in a study programme support achievement of the objectives and designed learning outcomes of the study programme.
- ✓ Different parts of the study programme form a coherent whole.
- ✓ The study programme includes practical training, the content and scope of which are based on the planned learning outcomes of the study programme.
- ✓ The study programme development takes into account feedback from students, employers, alumni and other stakeholders.

-

Comments

The aim of the study programme is to prepare specialists with a Master of Science (MSc.) degree, working in the road and bridge construction field of the construction domain and in the geodesy field of the geomatics domain who would correspond to level 7 requirements of the EQF for their knowledge, skills and attitude necessary for work.

The Bologna declaration and principles were adopted in Estonia in 2002, leading to the requirement for a Master's degree as a minimum to qualify as a 'Civil Engineer'. The nominal duration of civil engineering and architectural studies is five years and the workload is 300 ECTS credits. The **Road Engineering and Geodesy** study programme is compliant with the required programme length of five years and 300 ECTS. This is achieved through an integrated programme of 3 years common study (180 ECTS) combined with 2 years specialisation (120 ECTS) in either Road & Bridge Engineering or Construction Geodesy. The graduates can continue their studies on the doctoral level or apply for an Occupational Qualification according to the rules set by the Estonian Qualifications Authority.

TUT updated the programme in 2015 taking account of the right to issue the 'primary' Occupational Qualification (i.e. the 'primary diploma engineer', 7th level qualification), together with the formal education qualification (i.e. Master's degree) in the specified field. Practical experience is not mandatory while obtaining the primary qualification. The holder of the primary qualification may work in the appropriate specialist field of engineering if supervised by a specialist holding the qualification of a full diploma or chartered civil engineer. After obtaining two-years of engineering experience it is possible to apply for a full diploma engineer qualification. The curriculum was developed in consultation with experts from the main employers and had taken account of the Professional Qualification Standard for road and geodesy engineers. The standard, set out by the Estonian Qualifications Authority, was formulated in cooperation with the Estonian Association of Civil Engineers and the Estonian Asphalt Association for the Road & Bridge Engineering speciality and with the Estonian Association of Surveyors for the Construction Geodesy speciality. TUT now has the right to award the primary diploma engineer (7th level) qualification for Road Engineers in addition to the master's qualification.

Feedback from alumni (the quality of study programme, satisfaction with studies) and evaluations concerning employer satisfaction are collected centrally. The official feedback channel for students to evaluate courses is through the TUT Study Information System ÕIS. The usefulness of this has been hampered by low response levels but there is a requirement from 2015 for students to give this feedback before they can proceed with subject declaration for the next semester.

The study programme remains current and consistent with developments in society. The main working bodies involved in curriculum development are the Study Programme Committee of the Faculty and Programme Manager. Recent appointments have been made to address 2016 University curriculum requirements across all programmes, students' and employers' feedback.

Strengths

- The study programme is well-structured in respect of the modules, their relative credit value per subject area and the logicality of sequence.
- There are strong industry links through visiting lecturers and co-supervisors of final year projects.
- The feedback from alumni and employers confirms the high quality of the programme.

Areas of improvement and recommendations

- As identified in the self-evaluation process, ongoing programme enhancement could be further optimised by increased communication between contributing departments to reduce inadvertent overlap and potential for gaps.

Resources

Standards

- ✓ Resources (teaching and learning environments, teaching materials, teaching aids and equipment, premises, financial resources) support the achievement of objectives in the study programme.
- ✓ There is a sufficient supply of textbooks and other teaching aids and they are available.
- ✓ Adequacy of resources is ensured for changing circumstances (change in student numbers, etc.).
- ✓ Resource development is sustainable.

Comments

The programmes are delivered in the Mustamäe Campus, third study block, built in 1964 and renovated in 2006. The building has 18 lecture rooms and 24 rooms of laboratory and practical works format. A specific computer room of 13 seats is also available in the building, additional to resources available from students' personal laptops. Use is also made of the Civil Engineering computing facilities, notably specialized software for bridge engineering studies. A well-equipped Geodesy laboratory includes state-of-the-art laser scanners, drones, total stations and ArcGIS software. TUT has access to the online course management system Moodle, through the national system. TUT has a modern library, enhanced by the strength of a single electronic catalogue that is shared by all Estonian academic institutions.

Strengths

- The development of use of online module management system (Moodle) is ongoing and supported by a very qualified team of educational technologists.
- Every curricula subject has an academic coordinator who advises the head of department on specific infrastructure and software recommendations.

Areas of improvement and recommendations

- It is recommended to elaborate a plan for upgrading the computer room to reduce reliance on compensating for deficiencies through reliance on students' laptops as a supplementary resource.
- The provision of more specialized literature on roads and bridges in the Estonian language needs to be addressed.

Teaching and learning

Standards

- ✓ The process of teaching and learning supports learners' individual and social development.
- ✓ The process of teaching and learning is flexible, takes into account the specifics of the form of study and facilitates the achievement of planned learning outcomes.
- ✓ Teaching methods and tools used in teaching are modern, effective and support the development of digital culture.
- ✓ Practical and theoretical studies are interconnected.

  The organisation and the content of practical training support achievement of planned learning outcomes and meet the needs of the stakeholders.
- ✓ The process of teaching and learning supports learning mobility.
- ✓ Assessment of learning outcomes is appropriate, transparent and objective, and supports the development of learners.

-

Comments

The teaching and learning process is governed by TUT Academic Policies. The module descriptors clearly state the learning outcomes, methods and assessment. A thorough review of the module descriptors was conducted in 2009 by experts drawn from industry. The student workload is regulated with 26 academic hours per credit, with a maximum half of them being contact hours. There are strong industry links, especially in respect of the topics selected for final thesis preparation which allows a good balance of theory and practice in live research projects. This workload is regularly reviewed based on students' feedback. Internships are scheduled in the 5-year study programme after 3rd and 4th year with a duration of 5 and 6 weeks respectively (3 and 4 credits respectively). Defence of a practical training report is required at the end of each internship. Recognition for prior learning and work experience is regulated and procedures are in place to conduct oral examinations before granting approval. Academic fraud is regulated by the TUT Academic Policies and a national paper repository is used with software (www.kratt.edu.ee) to help deter and detect fraud. It is stated the situation is satisfactory but it is still a general concern for the Assessment Team. The self-evaluation report mentions that studying abroad (Erasmus exchange) is possible with a full credit transfer but the Assessment Team noted some difficulties in the actual facilitation of this for students.

Strengths

- The teaching and learning process clearly supports the learners' individual development and facilitates the achievement of the expected learning outcomes once the specialisation has been chosen.
- There are strong industry links, especially in respect of the topics selected for final thesis preparation which allows a good balance of theory and practice in live research projects
- The workload for the students has been carefully tuned over the years to meet the international norms for ECTS.

Areas of improvement and recommendations

- More effort is required to encourage and facilitate international mobility.
- During the interview with the students, it appears that their exposure and participation to ongoing research projects could be significantly improved in order to develop their skills with that regard. It seems that the intent is good but the supply of R&D live projects is less than that required.

Teaching staff

Standards

- ✓ There is teaching staff with adequate qualifications to achieve the objectives and planned learning outcomes of the study programme, and to ensure quality and sustainability of the teaching and learning.
- ✓ Overall student assessment on teaching skills of the teaching staff is positive.
- ✓ The teaching staff collaborate in the fields of teaching and research within the higher education institution and with partners outside of the higher education institution (practitioners in their fields, employers, and staff members at other Estonian or foreign higher education institutions).
- ✓ Recognised foreign and visiting members of the teaching staff and practitioners participate in teaching the study programme.
- ✓ The teaching staff is routinely engaged in professional and teaching-skills development.
- ✓ Assessment of the work by members of the teaching staff (including staff evaluation) takes into account the quality of their teaching as well as of their research, development and creative work, including development of their teaching skills, and their international mobility.

Comments

The academic staff are well-qualified and their research and development activity is closely aligned with the study programmes development. The workload is high due to the combination of research activity level with need to carry the maximum teaching load. The average age of the academic and research staff is 44 years. There is no fixed plan to finance staff replacement as retirements occur. However TUT is implementing a new academic career model from 2017 which may help in staff renewal. A greater involvement of visiting lecturers from industry is now used to enhance practical skills, following feedback from an extensive consultation in 2015.

Strengths

- Well-qualified and experienced academic and R&D staff.
- Teaching staff is involved in R&D activities which support the study process development and enhancement.

Areas of improvement and recommendations

- Develop a sustainable model for renewal of teaching staff numbers as retirements occur.
- Introduce a workload model to achieve an equitable balance between teaching and R&D activities for all staff.

Students

Standards

✓ Student places are filled with motivated and capable students.

The dropout rate is low; the proportion of students graduating within the standard period of study is large.

✓ Students are motivated to learn and their satisfaction with the content, form and methods of their studies is high.

✓ As part of their studies, students attend other Estonian and/or foreign higher education institutions as visiting or international students.

✓ Employment rate of alumni is high.

✓ Alumni and their employers are pleased with their professional preparation and social competencies.

Comments

The number of students entering the programme is decreasing rapidly by 10 to 20% per year. The dropout-rate is 16% with regard to the total number of students and 74% with regard to one year's class size (108 students, 23 admissions, 17 dropouts). However the Ministry's TULE (back to school) initiative is being actively promoted. There is usually only 1 student per year (1% of total students) on an exchange programme, despite links with Finland, Netherlands, Spain and Sweden. There is no evidence of exchange student incoming.

Strengths

- The satisfaction of employers has been verified by a scientific study.

- The Ministry's TULE (back to school) programme is being actively supported.

Areas of improvement and recommendations

- Students expressed a desire that the programme curriculum would focus more on geodesy. This is a matter that the University may wish to consider but no specific recommendation is offered by the Assessment Team.

1.3.3. Environmental Engineering (INT), Energy Efficiency of Buildings (M)

Study programme and study programme development

Standards

- ✓ The launch or development of the study programme is based on the Standard of Higher Education and other legislation, development plans, analyses (including labour market and feasibility analyses), and professional standards; and the best quality is being sought.
- ✓ The structure and content of modules and courses in a study programme support achievement of the objectives and designed learning outcomes of the study programme.
- ✓ Different parts of the study programme form a coherent whole.
- ✓ The study programme includes practical training, the content and scope of which are based on the planned learning outcomes of the study programme.
- ✓ The study programme development takes into account feedback from students, employers, alumni and other stakeholders.

Comments

The **Master in Environmental Engineering** is an integrated 5-year programme (300 credits). It was developed in 2002 but is currently being significantly revised with a reduction from three specialisations to two.

The programme aims to prepare graduates who are both technical specialists and who have skills necessary in management. It currently offers three streams of specialisation: (*i*) Heating and Ventilation; (*ii*) Water Engineering and (*iii*) Environmental Management. From academic year 2017/2018 the specialisations will be reformulated into two streams (*i*) Heating, Ventilation and Air Conditioning and (*ii*) Water and Environmental Engineering. Graduates will be awarded the

primary diploma engineer (7th level) qualification for engineers in their respective specialisation in addition to their master's degree. No such occupational qualification exists for Environmental Management.

The structure and content of modules support achievement of the objectives through a cohesive set of general study modules, basic modules (55 ECTS), core modules (74 ECTS) and advanced modules (24 ECTS), in addition to general study modules, electives (12 ECTS) and an obligatory internship (5 ECTS).

The **Master in Energy Efficiency of Buildings** is a 2-year programme (120 credits). It was launched in 2011 in response to developments in the labour market and building regulations. Firstly, there was the need to introduce a professional degree to address the requirement for a diploma engineer in energy performance at level 7 of the Estonian/European Qualification Framework. Secondly, the market predicted the need for 15 graduates annually to build up the critical mass of certified specialists authorised to carry out the work required to meet the legislative framework of the Building Act.

The structure and content of modules are cohesive but unfortunately the demand from the market was over-estimated. Therefore, in tandem with the TUT programme of curriculum reform, there will be no admissions in 2017 and the curriculum will become the main speciality stream within the **Master in Building and Infrastructure Engineering** from 2018/2019. There are longer term plans to launch the curriculum in English.

Both programmes comply with TUT internal regulations and a Curriculum Committee incorporates feedback from all stakeholders' representatives (students, lecturers, alumni and employers). The rapidly changing socio-economic environment and emphasis on sustainable development has informed the Curriculum Committee. The stakeholder feedback from the industry is complex, embracing no less than three representative groups in the field of water: Estonian Water Association (EVÜ), Estonian Union of Water Supply and Sewage Treatment Engineers (EVKIS) and the Estonian Waterworks Union (EVEL). Although the input is welcome, the dispersity of representative groups contributes to a weakness in cooperation with employers.

Strengths

- Relevance of the curricula to current and future labour market needs in the context of the economic imperative of sustainable development technologies.
- Interest in the course from international students, who would enrol if the language was not an impediment to their comprehension of the material.

Areas of improvement and recommendations

- Increase in enrolment through communication with high school students on the relevance of the programme and involvement of industry partners in promoting this message.

- The programmes should be shortlisted by TUT among those to be selected as flagship programmes for international student recruitment through offering selected programmes in English.
- Support from industry, preferably from a unified representative group, in promoting enrolment to the programmes.

Resources

Standards

- ✓ Resources (teaching and learning environments, teaching materials, teaching aids and equipment, premises, financial resources) support the achievement of objectives in the study programme.
- ✓ There is a sufficient supply of textbooks and other teaching aids and they are available.

  Adequacy of resources is ensured for changing circumstances (change in student numbers, etc.).

  Resource development is sustainable.

Comments

The programmes are very well resourced, especially the **Master in Energy Efficiency of Buildings**, whose launch was financially supported by the 'new curriculum development' fund of SA Archimedes. TUT has invested in the shared teaching spaces, computer rooms and wireless network to ensure that a well-developed infrastructure underpins the programmes. The Department of Environmental Engineering has an excellent suite of laboratories, especially a state-of-the-art equipped water chemistry laboratory, diffuse radiation laboratory (2010), direct solar radiation laboratory (2015) and ventilation laboratory (2015). Impressive teaching aids have been designed and constructed. A test building constructed in 2013 ('nZEB' – nearly zero energy building) is used in the programmes. The I.T. facilities are good, allowing a leading position in Estonia on students' skills development in dynamic building energy simulation.

TUT has a modern library, enhanced by the strength of a single electronic catalogue that is shared by all Estonian academic institutions. Additionally the Department has its own library giving ease of access to relevant standards, regulations. There are multiple copies of a specially commissioned suite of Estonian language textbooks through the financial support of SA Archimedes.

The sustainability of the laboratory resources is dependent on a return on investment through higher student numbers and future externally-generated overheads from funded research projects.

Strengths

- An excellent suite of laboratories.
- A modern library, enhanced by the strength of a single electronic catalogue.
- Specially commissioned suite of textbooks in Estonian language.

Areas of improvement and recommendations

- Refurbishment of the heating laboratory to further promote the Department's suite of laboratories as a centre of excellence for research-informed teaching and learning in this highly relevant area of scholarship.
- Increased efforts to make programme accessible to international students to add to other measures that will underpin revenue generation required to maintain laboratories in a state-of-the-art condition.

Teaching and learning

Standards

- ✓ The process of teaching and learning supports learners' individual and social development.
- ✓ The process of teaching and learning is flexible, takes into account the specifics of the form of study and facilitates the achievement of planned learning outcomes.
- ✓ Teaching methods and tools used in teaching are modern, effective and support the development of digital culture.
- ✓ Practical and theoretical studies are interconnected.
- ✓ The organisation and the content of practical training support achievement of planned learning outcomes and meet the needs of the stakeholders.

The process of teaching and learning supports learning mobility.

Assessment of learning outcomes is appropriate, transparent and objective, and supports the development of learners.

Comments

The teaching and learning process is governed by TUT academic policies, notably the Statute of Study Programme. This ensures that the module descriptors clearly state the programme aims, learning outcomes, methods and assessment. The

student workload is regulated with 26 academic hours per credit point, with a maximum half of them being contact hours. There is good evidence of 'learning by doing' and interdisciplinarity. However the opportunity for students to gain involvement in research projects, as part of their learning, has been hampered by the fact that many are also in employment during their studies. The lack of full exploitation of mobility schemes, such as Erasmus exchange, is disappointing. Academic fraud is regulated by the TUT Academic Policies but the culture among the students (generally in Estonia, as opposed specifically to evidence from this programme) is a general cause of concern for the Assessment Team.

Strengths

- There is good evidence of 'learning by doing' and interdisciplinarity.

Areas of improvement and recommendations

- The level of involvement of students in formal research projects, as part of their learning, should be mandatorily increased, both to enhance their learning and to justify significant investment in the modern facilities provided for their education.
- The process of teaching and learning does not currently support international mobility. It is recommended to improve the credit transfer system avoiding to extend the duration of studies.

Teaching staff

Standards

- ✓ There is teaching staff with adequate qualifications to achieve the objectives and planned learning outcomes of the study programme, and to ensure quality and sustainability of the teaching and learning.
- ✓ Overall student assessment on teaching skills of the teaching staff is positive.
- ✓ The teaching staff collaborate in the fields of teaching and research within the higher education institution and with partners outside of the higher education institution (practitioners in their fields, employers, and staff members at other Estonian or foreign higher education institutions).
- ✓ Recognised foreign and visiting members of the teaching staff and practitioners participate in teaching the study programme.
- ✓ The teaching staff is routinely engaged in professional and teaching-skills development.
- ✓ Assessment of the work by members of the teaching staff (including staff evaluation) takes into account the quality of their teaching as well as of their research, development and creative work, including development of their teaching skills, and their international mobility.

Comments

The academic staff delivering the **Master in Environmental Engineering** are well-qualified and research active. The well-resourced programme **Master in Energy Efficiency of Buildings**, whose launch was financially supported by the 'new curriculum development' fund of SA Archimedes, has been delivered by both the highly qualified staff and a very significant number of guest lecturers from industry and international academic institutions. TUT has a strategy in place for the continued professional development of staff (most recently the TUT Personnel Strategy 2012-2015) and metrics for staff research and mobility show a positive trend.

Assessment of the work by members of the teaching staff is in place, including student feedback through the TUT Study Information System ÕIS. However there is some disquiet among staff regarding the relative value placed by TUT on quality teaching in comparison with research. This is of course a problem for all academic institutions but is specifically referred to in the Self-Evaluation Report. There is also concern over the lack of industry-competitive financial incentives associated with a full-time academic career. The distribution of overheads on externally-funded research projects is not perceived as being equitable, by those bidding for research projects. Meanwhile there is also concern by staff over workload and workload distribution. Cumulatively this indicates a disconnect between the ambition of management for an internationally-ranked research active student-centred university of technology and the 'buy-in' of staff to the strategy.

Strengths

- The teaching staff of the Department of Environmental Engineering have achieved particularly high grades in student feedback.

Areas of improvement and recommendations

- The conditions for greater 'buy-in' of staff to the ambition of management for an internationally-ranked research active student-centred university of technology need to be identified and addressed by both management and academic staff.

Students

Standards

Student places are filled with motivated and capable students.

The dropout rate is low; the proportion of students graduating within the standard period of study is large.

✓ Students are motivated to learn and their satisfaction with the content, form and methods of their studies is high.

As part of their studies, students attend other Estonian and/or foreign higher education institutions as visiting or international students.

✓ Employment rate of alumni is high.

✓ Alumni and their employers are pleased with their professional preparation and social competencies.

Comments

The number of students entering the programme is decreasing rapidly by 10 to 20% per year. The dropout-rate in the **Master in Environmental Engineering** is 20% with regard to the total number of students and 60% with regard to a typical single year class size (157 students, 30 admissions, 20 dropouts). The dropout-rate in the **Master in Energy Efficiency of Buildings** is 30% with regard to the total number of students and 50% with regard to one year class size (30 students, 18 admissions, 9 dropouts). There is concern over the competence of students in mathematics when they enter the University. All students have the opportunity to participate in preparatory courses in mathematics free of charge but many drop out of the programme in first year due to weakness in mathematics. Only 2% of total students make use of exchange programmes. There are no exchange students incoming.

Strengths

- All students have the opportunity to participate in preparatory courses in mathematics free of charge.

Areas of improvement and recommendations

- The standard achieved in mathematics at time of entry to the bachelor stage of engineering programmes should be set higher as the minimum entry standard, to reduce the drop-out rate.
- The job opportunities in the field of energy efficiency of buildings are lower than the graduation numbers. Graduates in the field did not evaluate the situation that dramatically, but closer matching of the national capacity versus national demand would be advisable through institutional collaborations in respect of master's degree studies in energy efficiency of buildings.

2. Assessment report of SPG at Estonian University of Life Sciences

2.1. Introduction

Eesti Maaülikool, the Estonian University of Life Sciences (EMÜ) was founded in 1951 and is registered as a public legal entity – public university. The specialization of the University is in the field of agriculture and forestry. This derives from its origins, which can be traced back to Tartu Veterinary School (1848), Faculty of Agronomy (1919), Estonian Academy of Agriculture (1951), later re-named 'Estonian Agricultural University' (1991) and 'Estonian University of Life Sciences' (2005).

Although the overall ranking of the university is low, it is one of the top 100 universities in the world in its specialist field of agriculture and forestry, ranked in the 51-100 bracket in the QS World University Rankings by Subject, up from the 151-200 bracket in just a few short years. Regarding the study programme group 'Architecture and Building', the university does not appear in the relevant built environment subject area world rankings.

The study programmes of the university are organized into four institutes, including the 'Institute of Forestry and Rural Engineering' (IFRE) and the 'Institute of Technology'. The study programme group including 'Building' is under the former. The IFRE is responsible for activities and research in six areas, all related to natural resource management and environmental planning and modelling. Three of these are relevant to this report: Geomatics, Rural Building, and Water Management. IFRE monitors and organises Bachelor and Master level studies in Natural Resource Management, Forest Management, Forest Industry, Geodesy, and Land Management and Real Estate Planning. Two disciplines, Civil Engineering, and Hydraulic Engineering and Water Pollution Control, are taught at the integrated level combining both Bachelor and Master levels.

During a presentation made to the Review Panel on site it was indicated that there are 3,599 students studying in EMÜ (2015/2016), of whom 518 are in the study programmes of 'Architecture and Building' SPG. There has been a progressive decline in recent years, with the 'Building' SPG particularly badly affected. Due to the national demographic situation, in 2011–2015 the number of students studying at Estonian universities decreased by 19.4%. At EMÜ the number of students fell by 22.3% during the same period, whereas the number of students in 'Architecture and Building' SPG has suffered a greater loss rate of 30.1% (223 students). The statistical data on the student numbers concerning Building study programmes evaluated in this report are presented in Table 2.

TABLE 2. Statistical data of the Building Study programmes within the Architecture and Building Study Programme Group at Estonian University of Life Sciences, EMÜ

Title of study programme		Academic year				
		2016 /17	2015 /16	2014 /15	2013 /14	2012 /13
Civil Engineering (Rural Building) (INT)	No of students		215	243	262	280
	No of admission	34	28	34	34	43
	No of drop-outs		39	36	36	38
	No of graduates		15	24	23	22
Hydraulic Engineering and Water Pollution Control (INT)	No of students		83	101	112	133
	No of admission	0	8	16	22	22
	No of drop-outs		17	18	13	22
	No of graduates		13	7	16	17
Geodesy, Land Management and Real Estate Planning (B.Sc)	No of students		102	103	133	144
	No of admission	17	41	27	48	46
	No of drop-outs		34	23	34	38
	No of graduates		17	23	25	25
Land Management and Real Estate Planning (M.Sc)	No of students		34	33*	44*	50*
	No of admission	4	13	13	10*	18*
	No of drop-outs		4	5*	9*	8*
	No of graduates		10	7*	16*	8*
Geodesy (M.Sc)	No of students		19	13	9	20
	No of admission	6	6	10	3	5
	No of drop-outs		4	1	4	3
	No of graduates		4	1	2	10

Data source: Self-Assessment Report of Estonian University of Life Sciences, EMÜ (2016)

2.2. General findings and recommendations at the study programme group level

The Assessment Team commend the University on the comprehensive nature of the Self-Evaluation Report and the inclusion of a student representative among the contributors to the report.

The Assessment Team commend the clarity of the University's mission statement and development plan which sets the agenda for consolidating its national and international contribution to scholarship in the bio-economy sector. The achievement of a world ranking position in the 51-100 category at subject level (Agriculture and Forestry) is an endorsement of senior management's success in harnessing the talents of staff and excellent facilities to achieve shared goals. A further period of change management is currently bedding-in with structural changes under the 'ASTRA' programme. The Assessment Team applaud the senior management on their vision and change management strategy **but recommend that greater attention be paid to localisation of the change management process to ensure a consistent level of teamwork at all levels of the University community in working to shared goals. This should not least be reflected in a clear sense of identity of each study programme with the University's mission**.

Taking account of the University's mission statement, the Assessment Team comprehend the investment of resources in the study programmes 'Geodesy, Land Management and Real Estate Planning', 'Geodesy', 'Hydraulic Engineering and Water Pollution Control'. Less evident was a strong identity of the 'Civil Engineering (Rural Building)' study programme with the bio-economy sector central to the University mission statement. While recognising the value of retaining talented students in the region by offering a study programme in civil engineering, the Assessment Team remain to be convinced that an integrated programme on 'Rural Building' is appropriate. **It is recommended to look into the minimum requirements to be internationally defined as a Civil Engineering programme and to conduct a curriculum review to elucidate the aims between civil and rural engineering.** As part of this process consideration should be given to an evaluation of the alignment of the 'Civil Engineering (Rural Building)' programme with the criteria for professional recognition in Europe as a civil engineer, the University's mission, the resources available to support this programme if the subject area was in a world ranking position in the 51-100 category, and the possibilities presented by the Bologna framework to offer specialist master's degrees in 'Rural Building' for those who have completed general civil engineering studies in their first degree.

The situation regarding the pool of school-leavers competing for places in the programmes is not healthy, with low application volumes. The management have been reactive but this is a problem that requires a more proactive approach. **It is recommended that a stronger marketing campaign be initiated to emphasise the centrality of the University to the future development of**

the bio-economy and the opportunities to be part of this through its programmes.

The targets for internationalisation, whereby international student and staff levels will be at 12% and 10% respectively by 2020 is commendable, building on an impressive portfolio of bilateral agreements. The university has an effective system in place to create individual learning agreements with students on exchange programmes in order to transfer credits so that a student does not require additional time at EMÜ to complete their degree, on return from the host university. The Assessment Team noted however that outward mobility of students is still at a relatively low level due to a lack of enthusiasm from the students. **It is recommended that a more proactive approach be taken to engaging industry in promoting to students the value to employers of an international experience on their curriculum vitae.**

The potential for fraud during assessment exists in the current practice of reliance on local arrangements for organisation of written examinations. In addition, lecturers are placed in a difficult position if they have discretion at local level to deal with substantial cases of plagiarism in coursework submissions or attempts to cheat at written examinations. **It is recommended that end of semester examinations be administered on an institution-wide basis, independent of departments,** with adequate numbers of invigilators working to standard published procedures. **It is recommended where *prima facie* evidence of cheating exists, either in written examinations or in coursework, that strict enforcement of the academic misconduct policy be at institutional (and not departmental or lecturer) level.** The discretionary powers at lecturer level could be reintroduced when sufficient data exists to demonstrate that the culture of tolerating fraud by classmates is no longer a feature of student 'group-think'.

The Assessment Team were mindful of the potential loss of coherence in programmes as a result of modularisation. The existence of 2 and 3 ECTS modules in the programmes was a cause for concern in this regard. **It is recommended that the minimum module size should be 5 ECTS**.

The Assessment Team formed the impression that a sizeable number of students had a low motivation to educate themselves, but rather wanted to get through their studies as quickly as possible in order to get a job. **It is recommended that a range of measures be introduced to change this culture through making students more aware of the lifelong value of 'education' versus 'training'** and the necessity for a fundamental engineering education in meeting future challenges in the workplace of the professional. Drop-out mostly occur in the first year of study. We commend the university that they keep track of drop-outs in the first year separately to allow a more detailed analysis. However, this analysis shows that a huge amount of students drop out after their first year of studies. The university should especially increase their activity in the prevention of these drop-outs – please see the Assessment Teams general recommendations in this report including possible measures to ameliorate this problem in all institutions reviewed.

The staff development ambitions of the University were noted. There is an appetite among staff for growing scientific research output. **It is recommended that the University pays special attention to the needs of staff members who are completing the Ph.D.'s through formalising existing discretionary arrangements for reduced teaching load and sabbatical leave.**

2.3. Strengths and areas for improvement of study programmes by assessment areas

2.3.1. Geodesy, land management and real estate planning (B,M), Geodesy (M)

Study programme and study programme development

Standards

- ✓ The launch or development of the study programme is based on the Standard of Higher Education and other legislation, development plans, analyses (including labour market and feasibility analyses), and professional standards; and the best quality is being sought.

  The structure and content of modules and courses in a study programme support achievement of the objectives and designed learning outcomes of the study programme.

- ✓ Different parts of the study programme form a coherent whole.

- ✓ The study programme includes practical training, the content and scope of which are based on the planned learning outcomes of the study programme.

- ✓ The study programme development takes into account feedback from students, employers, alumni and other stakeholders.

Comments

The bachelors and master degree programmes in respect of **Geodesy, Land Management and Real Estate Planning** are in a continual state of development due to a combination of the demographic situation in Estonia (decreasing student numbers) and the requirements of the adoption of the Bologna declaration by Estonia in 2002. Since then a Master's degree is required as a minimum to qualify for Occupational Qualifications according to the rules set by the Estonian Qualifications Authority. Hitherto the Bachelor's Degree

programme **'Geomatics'** (2002-2015) of 180 ECTS, comprised general modules (57 ECTS), subject area modules (72 ECTS) thesis (10 ECTS), and optional modules (8 ECTS). The remaining credits were earned through choice of two distinct speciality electives: either **Geodesy** (33 ECTS) or **Real Estate Planning and Land Management** (33 ECTS). The name of the programme was changed in 2015 to **Bachelor's Degree in Geodesy, Land Management and Real Estate Planning** to reflect these specialisations. Graduates could then proceed to a **Master's Degree in Geodesy** or a **Master's Degree in Land Management Real Estate Planning**. However in response to the Bologna declaration it was decided to concentrate on general studies at bachelor's level and to move the specialisation decision point to master's degree level. Hence from academic year 2017/2018 the 33 ECTS speciality electives will be abolished in the bachelor's degree; the master's degree will have a new curriculum under the title **Master's Degree in Land Surveying and Land Management.** The new master's degree curriculum now incorporates the specializations: Geodesy (30 ECTS) or Land Management (30 ECTS). The curriculum of the master's degree study programme meets the requirements for the Occupational Qualification of 'Geodesist' and 'Land Manager', set by the Estonian Qualifications Authority. The master's curriculum of the study programme is the only curriculum at Estonian universities that provides the skills, knowledge and competences needed to obtain the Occupational Qualification of 'Land Manager' at the higher level.

The curriculum is continually developing under the study programme leader and the Curriculum Development Committee. The Committee teaching staff, industry and students. Official feedback from student evaluations is arranged through ÕIS. Feedback indicates some repetition of material across modules.

The Bachelor's Degree Programme contains only 8 subjects readily identifiable with the Study Programme Group 'Architecture and Building'. These are Fundamentals of Building (4 ECTS), Basics of Technical Infrastructure (7 ECTS), Short Course in Building Structures (3 ECTS), Assessment of Technical Conditions of Buildings (4 ECTS), Geodesy I (11 ECTS), Geodesy II ((8 ECTS), Practical Training in Geodesy (7 ECTS), Geology and hydro geology (4 ECTS). This represents only one quarter of the 180 ECTS programme. Road networks, a backbone of territorial planning, development and management is but a small part of the bachelors and master's degree programmes.

Strengths

- The programmes are very responsive to rapid changes in the technological and legal framework concerning geodesy and land management.

Areas of improvement and recommendations

- The proportion of the technical content of the programmes identifiable with the Study Programme Group 'Architecture and Building' needs to be strengthened **OR** the objectives and designed learning outcomes of the study programme **Master's Degree in Land Surveying and Land**

Management need to be revised with a view to moving it to a different Study Programme Group in conjunction with the planned renaming of the programme in 2017 to 'Land Surveying and Land Management'.

- The programme coherence needs to be strengthened by a review of module content overlap.

Resources

Standards

- ✓ Resources (teaching and learning environments, teaching materials, teaching aids and equipment, premises, financial resources) support the achievement of objectives in the study programme.
- ✓ There is a sufficient supply of textbooks and other teaching aids and they are available.
- ✓ Adequacy of resources is ensured for changing circumstances (change in student numbers, etc.).
- ✓ Resource development is sustainable.

Comments

The physical infrastructure is all co-located and was modernized in the last three years. The I.T. equipment and software is state-of-the-art. Digital data sets from various Estonian state agencies are available.

Strengths

- Physical infrastructure is all co-located and of high quality.
- I.T. equipment and software is state-of-the-art.

Areas of improvement and recommendations

- No recommendations

Teaching and learning

Standards

- ✓ The process of teaching and learning supports learners' individual and social development.
- ✓ The process of teaching and learning is flexible, takes into account the specifics of the form of study and facilitates the achievement of planned learning outcomes.

- ✓ Teaching methods and tools used in teaching are modern, effective and support the development of digital culture.
- ✓ Practical and theoretical studies are interconnected.
- ✓ The organisation and the content of practical training support achievement of planned learning outcomes and meet the needs of the stakeholders.

  The process of teaching and learning supports learning mobility.
- ✓ Assessment of learning outcomes is appropriate, transparent and objective, and supports the development of learners.

Comments

The teaching and learning process is composed of lectures, practical classes and independent study in the proportions 20%, 30% and 50% approximately. Fieldwork is conducted in the third semester, allowing significant 'hands-on' experience. There are many contributors to programme delivery. Feedback has indicated reduced satisfaction over the last few years with some lack of coherence in the programme being apparent through repetition of material across modules.

Strengths

- Significant practical training

Areas of improvement and recommendations

- The professional organisations that graduates of the programme will identify with in the future needs to be made transparent for the students.
- Mobility opportunities should be increased and promoted.

Teaching staff

Standards

- ✓ There is teaching staff with adequate qualifications to achieve the objectives and planned learning outcomes of the study programme, and to ensure quality and sustainability of the teaching and learning.
- ✓ Overall student assessment on teaching skills of the teaching staff is positive.
- ✓ The teaching staff collaborate in the fields of teaching and research within

the higher education institution and with partners outside of the higher education institution (practitioners in their fields, employers, and staff members at other Estonian or foreign higher education institutions).

Recognised foreign and visiting members of the teaching staff and practitioners participate in teaching the study programme.

✓ The teaching staff is routinely engaged in professional and teaching-skills development.

✓ Assessment of the work by members of the teaching staff (including staff evaluation) takes into account the quality of their teaching as well as of their research, development and creative work, including development of their teaching skills, and their international mobility.

Comments

The staff are well qualified and innovative. Several have delivered courses in other countries. A clear policy is in place regarding staff development at Ph.D. level (100% by 2020) and future mandatory international competition for recruitment positions (2025).

Strengths

- Innovative teachers, recognised by teaching awards and high student satisfaction ratings.

Areas of improvement and recommendations

- Leverage cutting-edge facilities and staff expertise to win more externally-funded research projects as an aid to supporting staff development.

Students

Standards

✓ Student places are filled with motivated and capable students.

The dropout rate is low; the proportion of students graduating within the standard period of study is large.

✓ Students are motivated to learn and their satisfaction with the content, form and methods of their studies is high.

As part of their studies, students attend other Estonian and/or foreign higher education institutions as visiting or international students.

- ✓ Employment rate of alumni is high.
- ✓ Alumni and their employers are pleased with their professional preparation and social competencies.

Comments

On basis of the provided numbers in the self-evaluation report, the panel finds that the number of students entering the programme has decreased rapidly in the last year. The dropout-rate in the Bachelor is 33% with regard to the total number of students, 80% with regard to a single year cohort and 59% in the first year (102 students, 41 admissions, 34 dropouts, 24 in the first year). The dropout-rate in the Master is 15% with regard to the total number of students, 42% with regard to one year and 21% in the first year (both programmes together 53 students, 19 admissions, 8 dropouts, 4 in first year). Only 3% of total students make use of exchange programmes. In the last years, all of these students were in an MSc programme.

Strengths

- EMÜ graduates make up the biggest part among land surveyors in Estonia and are well respected.

Areas of improvement and recommendations

- Based on indications in the interview, the panel recommends the programme managers to evaluate the sequence of the modules in the programme together with students and stakeholders.

2.3.2. Civil Engineering (Rural Building) (INT), Hydraulic engineering and water pollution control (INT)

Study programme and study programme development

Standards

- ✓ The launch or development of the study programme is based on the Standard of Higher Education and other legislation, development plans, analyses (including labour market and feasibility analyses), and professional standards; and the best quality is being sought.
- ✓ The structure and content of modules and courses in a study programme support achievement of the objectives and designed learning outcomes of the study programme.

- ✓ Different parts of the study programme form a coherent whole.
- ✓ The study programme includes practical training, the content and scope of which are based on the planned learning outcomes of the study programme.
- ✓ The study programme development takes into account feedback from students, employers, alumni and other stakeholders.

Comments

In 2002 Estonia adopted the Bologna declaration and principles. Since then a Master's degree is required as a minimum to qualify as a 'Civil Engineer'. The nominal duration of civil engineering and architectural studies is five years and the workload is 300 ECTS credits. The **Civil Engineering (Rural Building)** study programme and the **Hydraulic Engineering and Water Pollution Control** study programme are long-cycle study programme with the nominal length of five years (300 ECTS), ending with the defence of the Master's thesis. The graduates can continue their studies on the doctoral level or apply for Occupational Qualifications according to the rules set by the Estonian Qualifications Authority.

The Estonian University of Life Sciences has, since 2013, the right to issue the 'primary' Occupational Qualification (i.e. the 'primary diploma engineer', 7th level qualification), together with the formal education qualification (i.e. Master's degree) in the specified field. Practical experience is not mandatory while obtaining the primary qualification. The holder of the primary qualification may work in the appropriate specialist field of engineering if supervised by a specialist holding the qualification of a full diploma or chartered civil engineer. After obtaining two-years of engineering experience it is possible to apply for a full diploma engineer qualification. The Estonian Association of Civil Engineers (EEL) has evaluated the curricula of both the **Civil Engineering (Rural Building)** study programme and the **Hydraulic Engineering and Water Pollution Control** study programme. The Estonian Association of Civil Engineers has granted EMÜ the right to award the primary diploma engineer (7th level) qualification and acknowledges it for issuing the professional qualification. This information is stated on the diploma supplement.

In addition to the standard qualification of civil engineers, graduates of the **Civil Engineering (Rural Building)** study programme have knowledge and skills to design and build agricultural buildings (cowsheds, pigsties, agricultural production buildings, etc.). Designers of these buildings have to know contemporary technologies and requirements for keeping animals. EMÜ is the only university in Estonia where this subject is taught.

Graduates of the **Hydraulic Engineering and Water Pollution Control** study programme will hold the following primary Occupational Qualifications: 'Engineer

of Hydrotechnics' and 'Engineer of Water Supply and Sewerage'. The curriculum of the study programme is the only curriculum at Estonian universities that provides the skills, knowledge and competences needed to obtain the Occupational Qualification of Hydrotechnics at diploma and chartered level.

The curriculum of the **Civil Engineering (Rural Building)** includes digital technologies including CAD, FEM (Finite Element Methods), BIM (Building Information Modelling). The curriculum also contains subjects to support the development of student's general competencies. It is possible to learn foreign languages (English, German, Russian), informatics, engineering ethics. In the first year students get acquainted with the requirements of scientific work, they acquire digital literacy and learn how to find sources (Introduction to speciality and professional ethics) and develop entrepreneurship skills. Students get a short overview of Estonian legislation (Building code, Renovation requirements, etc.). One aim of the curriculum is to give theoretical knowledge about the construction and designing processes, the other aim is to put this knowledge into practice and gain some initial practical skills. Students have practical training every summer semester in total for 13 ECTS. They must pass the courses: 'Practical training in construction' and 'Practical training in building technology'. Group work is used in the study process to develop communication and teamwork skills. Oral presentations and discussion of course reports organised by the lecturers in numerous subjects is used to develop skills of expressing and defending their opinion.

The goal of the curriculum of **Hydraulic Engineering and Water Pollution Control** is to prepare professionals with a deep and broad knowledge on water engineering, taking into account technical, ecological, social and economic aspects.

The graduation thesis (30 ECTS) is assessed at a public defence by the Institute's defence board according to the University assessment scale. The defence board is composed of University staff as well as representatives of active engineers having preferably the highest Occupational Qualification, i.e. chartered level. After graduation outstanding Master theses in **Civil Engineering (Rural Building)**, nominated by the defence committee, are submitted to the contests organised by several professional associations (Timber House Association, Concrete Association), and the graduates of the speciality of rural building have been awarded several times.

Each study programme has a leader and the curriculum is gradually developing. There are Curriculum Development Committees in each department, which develop and evaluate the curriculum on a regular bases. It is led by the Curriculum Leader and includes teaching staff, industry and students. Partners of the department contribute to the curriculum development and help to carry out the practical training in enterprises. In the case of the **Hydraulic Engineering and Water Pollution Control** study programme, the Curriculum Leader is at the same time also the Head of the Department, thus in a position to decide upon the necessary financial support needed for the development.

The Curriculum Development Committee has introduced significant changes in the **Civil Engineering (Rural Building)** study programme. Beginning from 2016 subjects related to engineering are taught throughout the programme, starting from the first year. One reason for changing the curriculum was to rise the motivation of the first grade students, because the percent of dropouts after the first year was troubling. Now speciality-based subjects are included in the first semester of the curriculum. Another basic change was to reorder some groups of subjects to avoid overlapping in different lectures. At the proposal of timber frame producers the part of timber structures in the curriculum was increased. The improved curriculum turns more attention to the sustainability of construction and especially to timber buildings, as timber is local, natural and renewable material.

The official feedback channel for students to evaluate courses and lecturers is arranged through ÕIS and it is used considerably. At the end of the course students are asked to evaluate the subject and the teaching staff.

Strengths

Regarding the **Civil Engineering (Rural Building)** study programme:

- the curriculum is the only one teaching specialists in agricultural and farm building in Estonia;
- subjects are coherent and taught in a logical sequence;
- theoretical subjects are supported by significant practical training and laboratory work;
- arranging the practical training is in collaboration with the construction, designing companies and manufacturers of building materials and structures.

Regarding the **Hydraulic Engineering and Water Pollution Control** study programme:

- it is the only existing curriculum in Estonia at Master's level teaching land amelioration and inland hydraulic structures (as a part of hydraulic engineering);
- it is the only existing curriculum in Estonia giving primary Occupational Qualifications of Hydrotechnics Engineer;
- the curriculum enables students to encompass a wide range of aspects related to water engineering;
- the competence in Hydraulic Engineering (inland Hydraulic Engineering) is aggregated in EMÜ and the curriculum is unique in Estonia;
- the curriculum has a well-balanced theoretical and practical part that complement each other;
- curriculum development is in constant progress according to the changes in the labour market.

Areas of improvement and recommendations

The Assessment Team noted some areas of possible improvement, both common to many programmes and unique to particular ones. Regarding common areas that are directly connected to the curriculum:

- the University has the ambition to stimulate international mobility, incoming and outgoing. Yet there are only a few courses in English. It is important that the department raises the capability to give more courses in English, attract lecturers who speak English, train the core staff and open the organisation to adapt English courses, also in a cultural and organizational sense.
- the curriculum is influenced by staff members, students and many external factors. Subjects and course content change with the rapid developments in the world of work. For constantly evolving subject fields like Civil and also Hydraulics Engineering it is important to bring those influences together, not only on the level of the subject, but also on the level of the programme as a whole. Thus fostering the integration and coherence, the state of the art and the attractiveness. Otherwise overspecialisation and fragmentation take over. This process of constant change encompasses more than content, it is a way of looking to the fast changing world and a way of organizing an open discussion with all stakeholders
- not surprisingly it is part of this process to let yourself be influenced and to ask opinions continuously from the graduates and from the company owners as well

Regarding the **Civil Engineering (Rural Building)** study programme:

The Assessment Committee would like to raise a question of a fundamental nature. The programme is profiled as a 'Rural Building' Programme and the curriculum fits that profile. Nevertheless, as the department points out, The Estonian Association of Civil Engineers has evaluated the curriculum and granted EMÜ the right to award the primary diploma civil engineer (7th level) qualification. The review committee has some doubts whether that title withstands a comparison with the minimal requirements that are internationally defined for Civil Engineering. For instance the committee has not seen much emphasis on geotechnical engineering or construction of infrastructure (bridges and tunnels). The committee strongly recommends the department to clarify this point and to initiate a curriculum review to elucidate the aims between civil and rural engineering, informed by both the Estonian Association of Civil Engineers and international engineering professional practice across the EU labour market.

Regarding the **Hydraulic Engineering and Water Pollution Control** study programme, there are some areas of improvement described by the Department itself that the Assessment Team consider worthy of emphasis. They all have to do with the situation in which Hydraulics Engineering has found itself: good facilities, but no students. That imposes the need for efficient use of resources (financial

and personnel) and a serious rethinking of the programme and of the organization of the programme – not as a *stand-alone* but as a *partner* amidst the other engineering disciplines:

- the involvement of part time lecturers participating in scientific activities needs to be improved;
- visibility among the other engineering curricula has to be improved.
- ways of using staff more efficiently in order to meet both teaching and research objectives have to be developed;
- meetings with the teaching staff from other departments at the end of each semester have to be organized;
- shortages in course content or teaching methods should be analysed and necessary actions taken;
- feedback given by the employers and the developments in the Occupational Qualification Standards have to be analysed and taken into account.
- the course content should be strengthened
- coherence of the programme should be enlarged through collaboration with other departments and by inviting outside lecturers.

Resources

Standards

- ✓ Resources (teaching and learning environments, teaching materials, teaching aids and equipment, premises, financial resources) support the achievement of objectives in the study programme.
- ✓ There is a sufficient supply of textbooks and other teaching aids and they are available.
- ✓ Adequacy of resources is ensured for changing circumstances (change in student numbers, etc.).
- ✓ Resource development is sustainable.

Comments

All lecture and seminar rooms, most of the laboratories and all offices are located in the same sector of the building. In the Department of Rural Building, all lecture rooms are equipped with a data projector. The seminar room is equipped with a modern interactive board. All lecturers have offices and a computer from the employer. For better teaching specific laboratories and lecture rooms have been developed and supplied with needed models and equipment. The furnishing and equipment of laboratories is renewed if needed according to proposals and needs

of lecturers. The department has the special classroom equipped with contemporary computers (15 working places) and educational software is widely used in practice.

Building companies and manufacturers of building materials help the department by supplying the building materials needed for laboratory experiments. New testing facilities enable to measure the settlements and loads of different types of foundations. Laboratories are intensively used by students during the study process and in writing the Master's thesis.

Learning material of each subject and the lists of recommended and available literature are available in ÕIS. Students can use the university library, use literature collected by the lecturers of the Department (the list of books can be found in the university library) and read free of charge Science Direct articles and Estonian Building Standards using the password. The information from Estonian Building Information Association is loaded to the server of the Department of Rural Building and renewed quarterly.

Next to each other, two new laboratories have been built in 2013. The laboratory of structures for Civil Engineering and the large hydraulic laboratory for Hydraulic Engineering. There are also several small labs for specific purposes. The larger laboratories are used mainly by the final year students who perform their experiments for their Master's thesis.

Strengths

- At the end of 2013 the renovation of the Structures Laboratory was finished. This laboratory has broadened the testing facilities, e.g.obtained the 'strong floor' and 'strong wall' with the capacity of 200 kN (point load).
- Next to Structures Laboratory the large Hydraulic Laboratory was built. It is equipped with three flumes for different purposes and with three pumps with combined flow rate up to 250 l/s.
- Next to these large laboratories there is a good supply of test devices and equipment.
- Testing facilities are in constant modernisation. The Department of Rural Building plans to purchase a new complex of hydraulic testing devices for the laboratory of building structures and is creative in finding ways to accomplish that. The financing is organised through ASTRA (Structural Funds in the area of R&D).
- Financial resources enable the staff to do research work.
- Optimal use is made of human resources due to cooperation between institutes.
- Study materials are available to students in ÕIS.
- There is a sufficient number of well-equipped study rooms and laboratories.

- A library and a variety of electronic databases are available to students.
- The curriculum is the only one teaching specialists in agricultural and farm building in Estonia.
- There is a good cooperation with building companies to carry out practical training on sites.

Areas of improvement and recommendations

Recommendations in respect of areas of improvement have already been formulated by the Department itself in the self-evaluation. The goals are already defined by the Department but the path to accomplishing these goals was not yet identified by the Department. The Assessment Team have synthesised these points.

- As the department itself states in the self-evaluation: the feedback from students on laboratory provision and teaching materials is weak. So, effort should be put in activating the students to give feedback and comment on the programme and the facilities. Basic therefore is a sense of ownership, the feeling that it is their programme as well and that they are listened to and have influence.
- Given the ever existing need to improve the facilities to develop new knowledge, the department should be alert to take part in projects financed from external and internal resources. The department is aware of this. It has already taken part in several international EU projects that have helped much in purchasing new testing devices and equipment. New ones are in the pipeline: the Department is involved in the program ZEBE (almost zero energy buildings) 2016-2022, waiting for the results of a project led by Danube countries (sustainable and natural materials) and in a base financing project (the use and embodied energy content of local natural building materials to rise the using efficiency of materials) at EMÜ.
- For the Hydraulics Engineering: there is room for improvement of the facilities on field sites. Therefore agreements with land owners are needed, e.g. for the demonstration of drainage, irrigation, small hydro.
- Idem: to improve its visibility and enlarge its practice area Hydraulics Engineering should seek co-operation with the Ministries of Rural Life and the Environment for studies (on land amelioration, water pollution control, urban hydrology and resource management)

The recommendations are worth pursuing. All of them have to do with the relationship of the Department with its stakeholders, be it students, employers, ministries or research fellows. The recommendations are interrelated and the Assessment Committee thinks that altogether they are an invitation to quite a fundamental opening up of the Department. Together with the recommendations mentioned earlier they require serious teamwork and concerted efforts.

Teaching and learning

Standards

- ✓ The process of teaching and learning supports learners' individual and social development.
- ✓ The process of teaching and learning is flexible, takes into account the specifics of the form of study and facilitates the achievement of planned learning outcomes.
- ✓ Teaching methods and tools used in teaching are modern, effective and support the development of digital culture.
- ✓ Practical and theoretical studies are interconnected.
- ✓ The organisation and the content of practical training support achievement of planned learning outcomes and meet the needs of the stakeholders.

  The process of teaching and learning supports learning mobility.
- ✓ Assessment of learning outcomes is appropriate, transparent and objective, and supports the development of learners.

Comments

The teaching and learning process is in accordance with the standards for both programmes. EMÜ is using the online management system Moodle but for some courses only. Considering that the programmes are engineering related, an attention is given to practical training, field trips and laboratories. EMÜ do provide students with licences to professional software in CAD and 3D drawings. The student feedback is currently erratic as students' participation is not yet satisfactory. The student workload is monitored and 50% individual work is expected. Research is involved during master thesis only. Recognition for prior learning and work experience is regulated but the Review Team could not find any evidence of implementation. An attention is given to avoid any academic misconduct.

The curriculum in Civil Engineering consists of general modules (90 credits), specialty modules (150 credits).

Strengths

- The teaching and learning process clearly supports the learners' individual development through learning outcomes that include but are not limited to the Occupational Qualification Standards.

- The master theses made available during the site visit demonstrate a very good level of research, including international literature review and citation.
- The teaching workload for the students is meeting the international standards for such a programme, with a good balance between theory and practice.

Areas of improvement and recommendations

- Using Moodle should be further developed and made compulsory for every modules as it improves the student experience in any engineering subjects.
- There is an urgent need for improving student feedback collection.
- The teaching methods appear to be very classical and it is recommended to train the academic staff to active learning methods.
- The process of teaching and learning does not currently support international mobility. It is recommended to improve the credit transfer system avoiding to extend the duration of studies.
- During the interview with the students, it appears that their exposure and participation to ongoing research projects could be significantly improved in order to develop their skills in that regard.
- Regarding the programme in civil engineering, additional subjects would have to be considered or extended to be recognised as a civil engineering professional problem such in geotechnical engineering and infrastructure (bridges, tunnels).

Teaching staff

Standards

- ✓ There is teaching staff with adequate qualifications to achieve the objectives and planned learning outcomes of the study programme, and to ensure quality and sustainability of the teaching and learning.
- ✓ Overall student assessment on teaching skills of the teaching staff is positive.
- ✓ The teaching staff collaborate in the fields of teaching and research within the higher education institution and with partners outside of the higher education institution (practitioners in their fields, employers, and staff members at other Estonian or foreign higher education institutions).
- ✓ Recognised foreign and visiting members of the teaching staff and practitioners participate in teaching the study programme.

The teaching staff is routinely engaged in professional and teaching-skills development.

✓ Assessment of the work by members of the teaching staff (including staff evaluation) takes into account the quality of their teaching as well as of their research, development and creative work, including development of their teaching skills, and their international mobility.

Comments

The teaching staff is professional. The teaching staff has adequate qualifications but many of them are not holding a PhD degree yet. The age structure shows 27-28% of staff older than 60. Academic staff participates to professional training organised by relevant associations. EMÜ is organising some training about learning methods but attendance is not made compulsory. Most of the staff is engaged into research.

Several lecturers are engaged part-time, allowing them to also have time for professional work done in companies dealing with water engineering. In this case, it is expected that they have the certificate of Diploma/Chartered Hydrotechnics Engineer or Diploma/Chartered Water Supply and Sewage Engineer. Practitoners are also involved in lecturing some subjects.

Strengths

- The teaching staff has adequate qualifications to deliver the programmes learning outcomes.
- The teaching staff is engaged with regional engineering companies and/or professional associations.
- Some staff are involved in collaborative international research projects and take benefit of international mobility periods.
- The ratio between the number of staff and students meets international standards.

Areas of improvement and recommendations

- Considering the age structure, it is recommended to elaborate a strategic plan for future recruitment. In respect of a potential pipeline of applicants a better attention should be paid in attracting and recruiting PhD students.
- The participation of practitioners in the programmes delivery needs to be improved.

- Supportive measures should be taken to help the academic staff to complete their PhD if necessary by 2020.
- Staff development training are made available but the teaching staff is not routinely engaged in teaching-skills development. It is recommended to better assess the teaching performances and teaching staff engagement in self-development as part of the promotion criteria.
- The involvement of visiting guest lecturers from other Estonian or international higher education institutions should be further developed and integrated in the programme.

Students

Standards

Student places are filled with motivated and capable students.

The dropout rate is low; the proportion of students graduating within the standard period of study is large.

✓ Students are motivated to learn and their satisfaction with the content, form and methods of their studies is high

As part of their studies, students attend other Estonian and/or foreign higher education institutions as visiting or international students.

✓ Employment rate of alumni is high.

✓ Alumni and their employers are pleased with their professional preparation and social competencies.

Comments

The number of students entering the program has decreased rapidly in the last year.

Civil Engineering: The dropout-rate is 18% with regard to the total number of students, 139% with regard to one year and 36% in the first year (215 students, 28 admissions, 39 dropouts, 10 in the first year).

Hydraulic Engineering: The dropout-rate is 20% with regard to all students, 213% with regard to one year and 25% in the first year (83 students, 8 admissions, 17 dropouts, 2 in the first year [corrected number on basis of interviews]).

Only 3% of total students make use of exchange programmes. In the last years, all of these students were in an MSc programme.

Strengths

- Many students value the ability to conduct their studies in their home region.

Areas of improvement and recommendations

- The panel found the provided numbers in the self-assessment report to be inconsistent with information gathered during the on-site visit. For example, the number of drop-outs in the first year of Hydraulic Engineering in 2015/16 has been indicated to be 2 and not 8.
- The panel strongly recommends to evaluate the system with which the numbers are gathered and in particular to take the general recommendation on much more detailed analytics of the drop-out problem into account.
- The programme management of Hydraulic Engineering and Water Pollution Control is well aware of the admission problem. However, the panel is not yet convinced that the marketing measures that have been taken are sufficient to secure the survival of the programme. We want to emphasize our general recommendations on marketing.
- The programme management finds their programmes in a very challenged position in the Estonian higher education landscape. The panel would like to recommend the university to find a strategy where they can collaborate with other institutions on mutual problems and shared projects as well as sharpen their own profile in other areas.

3. Assessment report of SPG at TTK University of Applied Sciences

3.1. Introduction

TTK University of Applied Sciences (TTK) is a state institution of professional higher education administered by the Estonian Ministry of Education and Research. It can trace its origins back to a vocational secondary education institution but was reorganized into an institution of professional higher education in 1992, and since 1999 its name has been TTK University of Applied Sciences. The mission of TTK University of Applied Sciences is to support the sustainable development of Estonian society through applied higher education and knowledge transfer in the field of technology. The vision is to be an internationally renowned university of professional technical education, specialising mainly in the field of engineering.

There are five Faculties in TTK, providing instruction across three study programme groups: 'Architecture and Building'; 'Engineering, manufacturing and technology'; and 'Transportation Services'. Besides teaching and learning, TTK is also engaged in research and development, applied research and implementation of expert analyses. Dissemination of knowledge is achieved both through publication of the results and communication of expert knowledge at public events.

There are 2,249 students studying in TTK (01.11.2016), including 716 students in the study programmes of 'Architecture and Building' SPG. The statistical data on the student numbers concerning the Building study programmes evaluated in this report are presented in Table 3.

TABLE 3. Statistical data of the Building Study programmes within the Architecture and Building Study Programme Group at TTK University of Applied Sciences

Title of study programme		2015/16	2014/15	2013/14
Civil Engineering (Prof.HE)	No of students	343		
	No of admission	98	112	110
	No of drop-outs		157	167
	No of graduates	40		
Road Construction (Prof.HE)	No of students	208		
	No of admission	52	67	68
	No of drop-outs		77	65
	No of graduates	27		
Construction Geodesy (Prof.HE)	No of students	15		
	No of admission	0	11	23
	No of drop-outs		18	33
	No of graduates	20		

Source: Self-Assessment Report of TTK (2016)

3.2. General findings and recommendations at the study programme group level

The Assessment Team were very impressed by many aspects of the environment in which the study programmes were delivered. Foremost was the clarity of the vision and mission of TTK and senior management's strong sense of purpose in their response to the ambition of TTK. Successful delivery of programmes is achieved by a relatively young and dynamic academic staff, who share management's vision and strategy. The student-centred learning approach manifests itself in a strong sense of community (staff, student, alumni and employers) who share pride in their achievements together. All stakeholders felt they have an influence on programme development and management Loyalty to academic staff and the institution was evident through hard-earned respect.

Learning outcomes are clear, producing competent graduates from programmes which are fit for purpose to serve both those entering the job market or further master studies. A hallmark of the programmes was good integration of theoretical study and practical training in the study programmes. The student learning was informed by involvement in research contracts, of which there was no shortage. The research was conducted in laboratories with specific equipment acquired through strategic prioritisation in investment.

Regarding possible enhancements:

Survival of programmes is dependent on both admission and retention rates. Regarding admission rates the Assessment Team commend the "100 steps" programme and **recommends that the institution builds on the momentum from this education and marketing effort. Mindful of the drop-out rate problem in Estonian third level institutions, the Assessment Team recommends close monitoring of individual cases at each level** in every admitted year/cohort.

Short-term practical placements in companies overseas have been trialled and are successful. This is a valuable alternative to exchange semesters for students to gain international experience. The Assessment Team **recommends that the institution further develops and promotes the concept of practical placements in companies overseas**.

The Assessment Team found evidence that feedback is encouraged and quickly responded to with appropriate action. Some academic staff were singled out for praise in this regard. Whereas **there is clear evidence of quality loops, it is recommended to upgrade the quality assurance by formalising the processes, avoiding an over-reliance on individuals**.

Contact with research is not a usual or widely offered opportunity in the curricula. In order to support student's motivation in the second and third year, the

Assessment Team **recommends to challenge the students with problems from ongoing research as a part of the curriculum.**

The Assessment Team **encourages the institution, in their presented strategy, to increase the number of courses taught in English** as there was a noticeable demand for this.

As the institution is putting an effort into preparing students for Master studies at other institutions, the Assessment Team **recommends to gather feedback about the success of these students in their Master studies to further improve the preparation process**.

3.3. Strengths and areas for improvement of study programmes by assessment areas

3.3.1. Civil Engineering (Prof HE)

Study programme and study programme development

Standards

- ✓ The launch or development of the study programme is based on the Standard of Higher Education and other legislation, development plans, analyses (including labour market and feasibility analyses), and professional standards; and the best quality is being sought.
- ✓ The structure and content of modules and courses in a study programme support achievement of the objectives and designed learning outcomes of the study programme.
- ✓ Different parts of the study programme form a coherent whole.
- ✓ The study programme includes practical training, the content and scope of which are based on the planned learning outcomes of the study programme.
- ✓ The study programme development takes into account feedback from students, employers, alumni and other stakeholders.

Comments

The Curriculum of Civil Engineering is one of the three curricula of the Faculty of Construction, the work of which is organized by the Faculty Chair of Construction relying on the Institutions of Professional Higher Education Act and the Statutes

of TTK UAS and the Statutes of the Faculty of Construction. The objective of the Curriculum of Civil Engineering is to prepare construction engineers (Level 6 of the Qualification Framework) whose personal qualities are in compliance with the labour market requirements.

The Civil Engineering Curriculum graduates are awarded the primary qualification of construction engineer. Therefore, the curricula and subject courses are compiled on the basis of the professional standard Construction Engineer, Level 6, granting the compatibility with the requirements of the labour world. In addition, the graduates of TTK UAS have a possibility to continue studies in the Master's programme.

Fulfilment of objectives is assessed with feedback questionnaires. Every year feedback is taken from lecturers, students as well as alumni. In addition, the Faculty gets feedback from the enterprises where students work during practical training.

TTK UAS applies a course-based study system, ensuring a logical sequence of the subject courses in the Curriculum. Since 2015 a new Curriculum has been applied. The major amendments concerned the distribution of subject courses between semesters and harmonizing the volumes of courses (either 3 ECTS credits or 6 ECTS credits).

The Curriculum, is an integrated whole and ensures a logical sequence of teaching the subject courses, providing knowledge of mathematics and the basics of natural science and engineering sciences related to the field of construction. To increase the students' general competences, the goals of the Curriculum include the development of general knowledge and social maturity, teaching and learning foreign languages in the amount which enables self-improvement and working in the field of speciality. All the modules contain the subject courses for developing general competences. Lecturers also pay attention to the development of students' teamwork skills, using a lot of group work. The Curriculum of Civil Engineering includes 39 ECTS credits of practical training, which accounts for over 15% of the total capacity of the Curriculum. The most important types of practice are technology practice and engineering practice during which students are practising on a construction site as workers and middle manager's assistants.

For foreign exchange students there is an independent module in English (30 ECTS credits), comprising 15 ECTS credits of general subjects and 15 ECTS credits of subjects of construction speciality. In the academic year 2016/2017 the Curriculum of Civil Engineering contains two subject courses in English – Building Physics and Basics of Building Energy Efficiency and Technology Practice II. In the future it is planned to increase the number of subject courses in English. Estonian students can participate in the courses in English if they wish.

During the last two years the employment rate of the graduates of the Curriculum of Civil Engineering has been 100%.

The Faculty as well as the Curriculum are able to follow the trends in the society. For instance, following the feedback of employers, graduates and professional associations, a new subject course Modelling of Construction Information was

included in the Curriculum and at present there are discussions about introducing some courses concerning wooden buildings

Strengths

- There is evidence of good teamwork in study programme development, with lecturers of all courses participating, thus ensuring a logical sequence of courses and minimisation of content overlap.
- Guidance on time management related to course credits is provided to students through the Faculty of Construction's project 'Self-Guiding Student'.
- The study programme development has taken account of the need for consistency in the integration of e-learning support (95% target by 2017) allowing good co-operation between the lecturers of the Faculty of Architecture and Environmental Engineering and the Faculty of Construction in teaching students of both Curricula.

Areas of improvement and recommendations

There are very few areas for improvement (keep up the good work!) but a recommendation is offered in the context of interdisciplinary opportunities:

- The programme is attentive to the development of students' teamwork skills, using a lot of group work. It is noted however that this teamwork only takes place inside the Civil Engineering teaching group. It is recommended to reach out to the Architecture students as well for some more interdisciplinary experiences.

Resources

Standards

- ✓ Resources (teaching and learning environments, teaching materials, teaching aids and equipment, premises, financial resources) support the achievement of objectives in the study programme.
- ✓ There is a sufficient supply of textbooks and other teaching aids and they are available.
- ✓ Adequacy of resources is ensured for changing circumstances (change in student numbers, etc.).
- ✓ Resource development is sustainable.

Comments

At the end of 2015 the Faculty Chair possessed 8 laboratories with the total area of 800 m^2. The students of all the specialties of the Faculty can use the laboratories. At the end of 2016 renovation of the laboratories was completed with the aim to make the labs more easily accessible and user-friendly. The laboratories can be used to conduct teaching, RDC activities, as well as for students' independent work. The laboratories are well equipped. The laboratory of mechanical tests is equipped with a unique test rig for building structures used to test the carrying capacity of structures. The Faculty's mobile laboratory is designed in a way as to use the measuring equipment during studies as well as to conduct expertise to assess the technical condition of construction structures. Some laboratories have very simple equipment necessary to reinforce students' basic knowledge (e.g. blower-door test in the field laboratory of construction physics, tests of materials compression strength in the laboratory of construction materials etc.) One of the major trends in recent years has been the development of digital technology. The Faculty has two laboratories related to the area – laboratories of digital construction and virtual reality. The latter houses BIM CAVE which is unique in the Baltic states. BIM CAVE enables to visualize models in such a way that users perceive they really are in the virtual environment.

All the lecture rooms are in good condition and equipped with modern presentation technology. Some rooms have more specific equipment for carrying out teaching (e.g. smartboard, document projector etc.). The Faculty has two computer rooms with all the necessary software programmes.

TTK UAS has a well-functioning library which purchases and orders books and speciality journals and provides a possibility to use digital data bases. The students and lecturers of the Faculty of Construction have web-based access to the necessary standards. The Faculty also has its own information centre with the necessary study materials (ET and ETF card indexes). TTK UAS is applying different web-based data bases for conducting studies and administering documentation. The official environment for sharing information concerning studies is the Study Information System (SIS). To upload study materials or create e-courses, the Moodle environment is used. There is a digital repository for keeping digital books, uploading students' graduation theses etc. The official documentation of TTK UAS is kept in the Document Management System (DMS). The goal for the nearest future is to update the SIS in a way as to meet the contemporary requirements.

As for the study aids, every lecturer has a personal laptop, there is a printer in every workroom and a data projector in all lecture rooms. In addition, the Faculty has two powerful copying machines for printing, copying and scanning. Support on all IT problems is available to lecturers. Lecturers can borrow smaller

equipment they do not need every day (e.g. video cameras to film tests) from IT Technology Service.

The students of the Faculty of Construction can use the Faculty's information centre, which is open until late hours, for group work. In 2016 cloud printing service was introduced.

The lecturers of the Faculty are satisfied with the lecture rooms and study aids and equipment for conducting teaching (95% positive feedback). In 2014 the ventilation system of the Faculty was built, in 2016 the heating system was replaced and lighting was improved. Since 2015 the Faculty has a recreation room for its academic staff.

Strengths

- The facilities of the engineering department are impressive: laboratories, test equipment, a BIM Cave. All facilities are well designed, clean and inviting. Future financial risks will have a greater impact on the laboratories which have the most expensive equipment. Taking account of this, the laboratories have been equipped in a way as to be used both by students and the laboratory staff for R&D work.
- Infrastructure investment is planned taking account of specialist facilities in other higher educational institutions, creating a basis for collaboration with the neighbouring universities.

Areas of improvement and recommendations

- In the lecture rooms and workrooms ventilation and lighting should be improved.
- To optimize resources, better conditions for delivering joint lectures to different student groups (up to 100 students) should be created.
- To raise the quality of laboratories, accreditation of the labs must be initiated.
- As for the work environment of the lecturers the situation is not so good. The department is well aware of this and the problems are being dealt with.

Teaching and learning

Standards

- ✓ The process of teaching and learning supports learners' individual and social development.
- ✓ The process of teaching and learning is flexible, takes into account the

specifics of the form of study and facilitates the achievement of planned learning outcomes.

- ✓ Teaching methods and tools used in teaching are modern, effective and support the development of digital culture.
- ✓ Practical and theoretical studies are interconnected.
- ✓ The organisation and the content of practical training support achievement of planned learning outcomes and meet the needs of the stakeholders.

  The process of teaching and learning supports learning mobility.
- ✓ Assessment of learning outcomes is appropriate, transparent and objective, and supports the development of learners.

Comments

The quality of the teaching and learning process is actively managed by the Faculty through goals and performance indicators which inform financial support to staff development in pursuit of the goals. The learning outcomes and their related delivery and assessment methods are described in the syllabus which is introduced to the students at the beginning of the course. The students' broad education is encouraged through a quarter of the curriculum developing the general competences (languages, entrepreneurship, communication skills), team-building skills and the inclusion of visiting lecturers.

The individual circumstances of students are catered for through the option of full-time or part-time study load offered as daily studies or distance learning. An additional option is external study. The impact of distance learning has impacted generally and recently attention has been paid to the 'flipped classroom'. This method has proved to be especially efficient, supported by active engagement by academic staff in pedagogical training courses on new teaching methods and study aids. These options facilitate learning, especially for students who combine studies with work. Given the high percentage of students with work experience, the University recognizes prior learning and work experience (RPL) with each case considered individually.

Practical training is core to the learning experience and many students are also engaged in employment. Many students write their graduation theses based on the material collected in the enterprise they had the engineering practice, and after graduation they get employment in the same enterprise. The supervisor of the thesis can be a professional outside the Faculty; in this case a co-supervisor among the lecturers of TTK UAS is appointed. Half of the members of the Graduation Theses Evaluation Committee have to be from outside TTK UAS.

Students have a possibility to participate in research projects either as part of a related subject course, project or coursework. Students may also use such an opportunity for a graduation thesis after participation in such a project. The research result can be an article (published in TTK UAS Students' Transactions) or a research paper for in-house research competition organized by the Students' Research Association HEUREKA or for public professional competition.

Students feedback on the teaching and learning process is in general positive.

Strengths

- To date five e-courses have been awarded a quality sign by the Information Technology Foundation for Education (HITSA).
- Teachers are offering and tutoring individual learning paths for students in support of fastest-track graduation.
- Students are particularly satisfied with the group work as a teaching method.

Areas of improvement and recommendations

- A thorough feedback system has been created, but the responding activity of students needs to be enhanced.
- Students' international mobility also needs to be more active. To achieve this, cooperation with foreign partners has to be improved and the number of courses taught in English must be increased.
- In the beginning of this report some general recommendations are given that concern all the universities visited. They regard the need for a marketing strategy for technical studies, the dropout-problem and the need to foster the international mobility. These recommendations equally apply to the Faculty of Construction Engineering of TTK.

Teaching staff

Standards

- ✓ There is teaching staff with adequate qualifications to achieve the objectives and planned learning outcomes of the study programme, and to ensure quality and sustainability of the teaching and learning.
- ✓ Overall student assessment on teaching skills of the teaching staff is positive.
- ✓ The teaching staff collaborate in the fields of teaching and research within the higher education institution and with partners outside of the higher education institution (practitioners in their fields, employers, and staff members at other Estonian or foreign higher education institutions).

- ✓ Recognised foreign and visiting members of the teaching staff and practitioners participate in teaching the study programme.
- ✓ The teaching staff is routinely engaged in professional and teaching-skills development.
- ✓ Assessment of the work by members of the teaching staff (including staff evaluation) takes into account the quality of their teaching as well as of their research, development and creative work, including development of their teaching skills, and their international mobility.

Comments

The goal of the Faculty Chair is to involve in the teaching process professionals who are motivated and interested in developing the speciality. Besides ordinary lecturers, instruction is carried out by visiting lecturers who are working in companies. The academic staff of the Faculty Chair includes 12 ordinary lecturers (among them 2 professors, an associate professor, 9 lecturers and an assistant) and 5 visiting lecturers. Additionally, practising engineers are invited to deliver lectures. Every year about ten professionals deliver lectures to students. Lecturers are elected to the position by way of a public competition. The Faculty Chair acts as a mentor. The average age of the lecturers of the Faculty Chair is 41.

The areas of lecturers' RDC activities are mostly related to the courses they deliver. Students are also involved in research, and as a rule, they are very interested in dealing with certain topics in depth. In the lecturer's teaching load certain hours are allocated for preparing RDC activities, but lecturers are additionally paid for carrying out research. Every year lecturers organize different speciality-related events (Concrete Day, Project Manager Day etc.) and conduct in-service trainings, the volume of which has considerably increased during recent years. For professional improvement (Doctoral studies, teaching in a foreign university) a lecturer can have a free semester. To maintain professional competence, a lecturer can be in training in an enterprise (the lecturer's salary for the period is maintained).

According to feedback questionnaires, students are satisfied with the lecturers. As for the suggestions, students think the lecturers should present more examples and tasks from practical life in the lectures. Lecturers can familiarize themselves with the subject monitoring feedback and take account of students' suggestions.

Strengths

- Highly motivated staff, active in developing their pedagogical skills, research speciality and training in enterprises. A lecturer who is in

doctoral study has a reduced teaching load and gets a grant from a young lecturer's programme.

- The expert opinions of the lecturers of the Faculty Chair are often reflected in the media.
- Significant relationship with enterprises through training courses for companies and a bridge to new research questions.

Areas of improvement and recommendations

- This description in the self-evaluation report seems to be a bit too ideal. In the meetings with the lecturers and staff the review committee could establish that:
    - staff had many opportunities to attend courses and training. Yet not everyone was able to do so. It was not the money that stood in the way, but the workload.
    - energy of teaching staff was primarily put in professionalising themselves in their disciplinary field, less in teacher training.
- It is recommended that training teaching methods is emphasised and that suitable supports are made available.
- The proportion of international lecturer exchange should be increased by inviting more foreign lecturers to TTK UAS. The Faculty Chairs and the International Relations Office are enhancing cooperation in this area.

Students

Standards

✓ Student places are filled with motivated and capable students.

The dropout rate is low; the proportion of students graduating within the standard period of study is large.

✓ Students are motivated to learn and their satisfaction with the content, form and methods of their studies is high.

As part of their studies, students attend other Estonian and/or foreign higher education institutions as visiting or international students.

✓ Employment rate of alumni is high.

✓ Alumni and their employers are pleased with their professional

preparation and social competencies.

Comments

On basis of the provided numbers in the self-evaluation report, the panel finds the following statistics:

- The dropout-rate is 36% with regard to the total number of students and 140% with regard to one year (112 admissions, 157 dropouts).

Strengths

- Strong sense of community, leading to strong graduate attributes valued by employers.
- Strong sense of confidence and ambition underpinning the 10 to 20% who go on to masters studies.

Areas of improvement and recommendations

- Build on the programme's core strengths (staff, facilities, student experience) to increase admissions and reduce drop-out rate before trying too many innovations, such as increased specialisations.

3.3.2. Construction Geodesy (Prof HE), Road Construction (Prof HE)

Study programme and study programme development

Standards

The launch or development of the study programme is based on the Standard of Higher Education and other legislation, development plans, analyses (including labour market and feasibility analyses), and professional standards; and the best quality is being sought.

✓ The structure and content of modules and courses in a study programme support achievement of the objectives and designed learning outcomes of the study programme.

✓ Different parts of the study programme form a coherent whole.

✓ The study programme includes practical training, the content and scope of which are based on the planned learning outcomes of the study programme.

- ✓ The study programme development takes into account feedback from students, employers, alumni and other stakeholders.

Comments

The curriculum of **Construction Geodesy** is organized by the Faculty Chair of Construction Geodesy, as part of the Faculty of Construction. The 4 year programme (240 ECTS) prepares graduates for work as professional geodesists but the professional qualification cannot yet be awarded as discussions are still taking place by the awarding authority. The curriculum of **Road Construction** is organized by the Faculty Chair of Road Construction, as part of the Faculty of Construction. The 4 year programme (240 ECTS) prepares graduates for work as Road Construction Engineer, Level 6 (road maintenance specialists) qualified to the professional standard. Graduates of both programmes may also proceed to master's degree studies. The curricula have clear subject divisions with associated learning outcomes. The sequence is logical. Practical training amounts to 42 ECTS with at least 36 ECTS (15% of the total) taking place in enterprises. Student exchange is facilitated, not least by 20 Erasmus partnerships in the Road Construction programme but greater take-up of opportunities by students is desirable.

The **Construction Geodesy** programme traditionally has low enrolment numbers but there is market demand for about 15 graduates per annum, affirmed by a working group representing several third level institutions and employers in 2015. However the professional qualification issue is not yet resolved. No students were admitted in 2016/2017 during the period of restructuring the programme. Meanwhile discussions continue for a 2017/2018 intake, with expectations that the programme will be integrated with Road Construction, modified to allow an increased proportion of construction geodesy.

Strengths

- Inclusive consultation on curriculum development within TTK.
- Inclusive consultation on Road Construction curriculum development with the Road Institute of Tallinn University of Technology, where some students progress to masters studies.
- Sustained market demand for graduates.
- Curriculum alignment of **Road Construction** with Nordic countries, ensuring good student exchange possibilities through Erasmus partnerships.

Areas of improvement and recommendations

- The situation regarding professional qualifications in the field of Construction Geodesy must be clarified as soon as possible, as uncertainty is impacting on both programmes.
- As identified in the self-evaluation report, the significance of BIM in practice now requires more attention to this in the curriculum.

Resources

Standards

- ✓ Resources (teaching and learning environments, teaching materials, teaching aids and equipment, premises, financial resources) support the achievement of objectives in the study programme.
- ✓ There is a sufficient supply of textbooks and other teaching aids and they are available.
- ✓ Adequacy of resources is ensured for changing circumstances (change in student numbers, etc.).
- ✓ Resource development is sustainable.

Comments

Excellent resources are available in respect of geodesy instruments and software, both in-house and in co-operation with external bodies. The latter include partner enterprises of the Faculty Chair of Construction Geodesy and the Tallinn University of Technology (laser scanner). The laboratories include a Road Construction Test Pit, unique in the Baltic Countries. A new test laboratory of geosynthetic materials is expected to be commissioned during 2017. There is a sufficient critical mass of users from several programmes, justifying the investment and assuring sustainability of demand for high quality resources. There are additional considerations regarding accreditation of laboratories to gain external funding for testing and research. Account is taken of students' varied learning styles and e-support is of a recognised high standard. The library is well stocked and has good database access.

Strengths

- Co-operation with external bodies in access to state-of-the-art geodesy technology.
- Road Construction Test Pit, unique in the Baltic Countries.

Areas of improvement and recommendations

- As identified in the self-evaluation report, a programme to support the accreditation of laboratories.
- As identified in the self-evaluation report, some modernisation of the indoor climate quality (lighting and ventilation) certain lecture theatres.

Teaching and learning

Standards

- ✓ The process of teaching and learning supports learners' individual and social development.
- ✓ The process of teaching and learning is flexible, takes into account the specifics of the form of study and facilitates the achievement of planned learning outcomes.
- ✓ Teaching methods and tools used in teaching are modern, effective and support the development of digital culture.
- ✓ Practical and theoretical studies are interconnected.
- ✓ The organisation and the content of practical training support achievement of planned learning outcomes and meet the needs of the stakeholders.
- ✓ The process of teaching and learning supports learning mobility.
- ✓ Assessment of learning outcomes is appropriate, transparent and objective, and supports the development of learners.

Comments

About half of the **Construction Geodesy** programme is common to the **Road Construction** programme. The programmes are offered as daily studies (full-time or part-time) or as distance learning. The Open University is also an option for courses. This addresses the needs of those who wish to combine studies with working and other duties. Flexibility is thus provided for many learning styles and situations. Support is provided through published consultation hours and a strong e-learning environment (web conversations and forums). Workload is well-distributed across the semesters. The learning outcomes, content, schedule, specific independent learning expectations and assessment criteria are well documented. A strong e-learning environment is evolving of high quality. Visiting lecturers are a strong feature of the programmes. The theoretical and practical training is well integrated. Students have no difficulty in finding practical training work places. Despite many good opportunities for Erasmus exchange the take-up is relatively low. It is felt that increased exposure to modules presented in English

would enhance international mobility participation rates by both staff and students.

Strengths

- Flexibility is provided for many learning styles and situations.
- A strong e-learning environment is evolving of high quality.

Areas of improvement and recommendations

- Increased exposure to modules presented in English would enhance international mobility participation rates by both staff and students.

Teaching staff

Standards

- ✓ There is teaching staff with adequate qualifications to achieve the objectives and planned learning outcomes of the study programme, and to ensure quality and sustainability of the teaching and learning.
- ✓ Overall student assessment on teaching skills of the teaching staff is positive.
- ✓ The teaching staff collaborate in the fields of teaching and research within the higher education institution and with partners outside of the higher education institution (practitioners in their fields, employers, and staff members at other Estonian or foreign higher education institutions).
- ✓ Recognised foreign and visiting members of the teaching staff and practitioners participate in teaching the study programme.
- ✓ The teaching staff is routinely engaged in professional and teaching-skills development.
- ✓ Assessment of the work by members of the teaching staff (including staff evaluation) takes into account the quality of their teaching as well as of their research, development and creative work, including development of their teaching skills, and their international mobility.

Comments

The academic staff of the Faculty Chair of **Construction Geodesy** includes 4 ordinary lecturers (an associate professor and 3 lecturers) and 9 visiting lecturers

(including a professor from EMÜ). The academic staff of the Faculty Chair of **Road Construction** includes 5 ordinary lecturers (an associate professor, 3 lecturers and an assistant) and 3 visiting lecturers. Additionally, practising engineers are invited to deliver lectures. Every year about 15 professionals deliver lectures to students across the two programmes. Lecturers are elected to the position by way of a public competition. The Faculty Chair acts as a mentor. The average age of the lecturers across the two programmes is similar, at approximately 42. The staff are active in applied research and financial reward is linked to research activity. Student satisfaction is high.

Strengths

- Well qualified and highly motivated, research-active staff.
- Good succession planning.

Areas of improvement and recommendations

- The number of staff with Ph.D. qualifications should be encouraged through career development plans supported by the institution.
- The balance between development of personal teaching and research profiles should be managed through institutional staff policies that recognise realistic workloads.
- The opportunities for staff to engage in international collaborations in teaching and research should be facilitated to the fullest extent possible.

Students

Standards

- ✓ Student places are filled with motivated and capable students.
- ✓ The dropout rate is low; the proportion of students graduating within the standard period of study is large.
- ✓ Students are motivated to learn and their satisfaction with the content, form and methods of their studies is high.
- ✓ As part of their studies, students attend other Estonian and/or foreign higher education institutions as visiting or international students.
- ✓ Employment rate of alumni is high.
- ✓ Alumni and their employers are pleased with their professional preparation and social competencies.

Comments

On basis of the provided numbers in the self-evaluation report, the panel finds the following statistics:

- The dropout rate is 30% with regard to the total number of students and 120% with regard to one year (78 admissions, 95 dropouts).

Strengths

- Publication of research, for example in 'Teeleht'.

Areas of improvement and recommendations

- Prioritise tackling the drop-out rate.