



Final Study Programme Evaluation Building Engineering Systems (professional bachelor)

at

Vilniaus technologijų ir dizaino kolegija

Assessment report

4 April 2012

Assessment report of the professional bachelor study programme Building Engineering Systems. The final evaluation was carried out by evalag as part of the Project Engineering Study Field Program Renewal Implementing Innovative Teaching/Learning Methods and Encouraging Internationalization VP1-2.2-ŠMM-07-K-01-120.



Building Engineering Systems

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Vilniaus technologijų ir dizaino kolegija (VTDK) commissioned **evalag** with the final programme evaluation of the newly created professional bachelor study programme “Building Engineering Systems”. The programme evaluation was carried out by an international expert team that assessed the study programme according to the Lithuanian quality assurance standards and the European Standards and Guidelines for Quality Assurance in the European Higher Education Area with the objective of accrediting and registering the programme according to Lithuanian higher education law and awarding **evalag**’s international quality label for study programmes.

1. Vilniaus technologijų ir dizaino kolegija (VTDK)

VTDK is a public Lithuanian non-university higher education institution that offers college level study programmes which are directed towards a professional activity. The college in its present form was created by merging several colleges in Vilnius in the fields of engineering and design – this gives the college its distinct profile.

According to Lithuanian law, college level higher education institutions (kolegija) offer full-time and part-time professional bachelor degrees that allow graduates to pursue a professional career. Master degrees are not offered. Graduates who want to pursue a master degree at a Lithuanian university need to complete one and a half years of bridge courses to meet the admission requirements.

VTDK has about 4000 students and offers 22 professional bachelor programmes in the fields of engineering and design in the following four faculties:

- Civil engineering faculty
- Faculty of design
- Railway transport faculty
- Faculty of technical sciences

The college’s mission is to be a partner in the development of a sustainable society. On the basis of this mission the college has developed a strategic plan for its development and management. VTDK has recently been very active and successful in acquiring EU-funding. The college finished or still carries out a number of projects to renew its study programmes, to renovate its building, to update its equipment, to develop its staff, to collaborate with its European partner institutions and to develop its internal quality management.

The building engineering systems programme is offered by the civil engineering faculty, which offers for its 855 students altogether four study programmes:

- Civil engineering
- Building engineering systems
- Thermal engineering
- Geodesy and cadastre

Responding to the recent higher education reform in Lithuania and an employer’s survey carried out by the college, the faculty completely updated the three first-named study programmes in order to adjust the programme contents to the demands of the labour market and to broaden the competences of the graduates.

2. The Building Engineering Systems programme

The building engineering systems professional bachelor programme offers graduates a practice-oriented education which is closely targeted to the Lithuanian labour market. The graduates are educated to perform tasks of a building engineering systems installation and maintenance engineer.

The college offers the programme as a three-year full-time programme and a four-year part-time programme.

The “building engineering systems” programme has been redesigned due to the appearance of new technologies and changed requirements of the labour market. Therefore, the theoretical part of the programme has been updated. The programme now covers four main topics: heating, ventilation, water supply and sewerage. Additionally, the proportion of laboratory work has been increased and new learning materials for students have been produced by the lecturers.

3. Accreditation process

The programme evaluation was carried out with a peer review on the basis of a self-evaluation report provided by the college, a site visit of an expert team, an assessment report by the expert team and the accreditation decision by **evalag**'s accreditation commission.

The final expert evaluation (the performance principles, steps, processes, and procedures of the evaluation) was conducted in accordance with the *Standards and Guidelines for Quality Assurance in the European Higher Education Area (2005)* and documents regulating the implementation and evaluation of study programs in the Republic of Lithuania (*Study Program External Evaluation and Accreditation Procedures Description*, approved by the July 24, 2009, Order No. ISAK-1652 of the Minister of Education and Science of the Republic of Lithuania, and *Study Programs Intended-To-Be-Implemented Preparation Description and Their Compliance With Approved General And Specific Requirements For Study Programs Establishing Methodological Guidelines Approved by the Minister of Education and Science of the Republic of Lithuania*, approved by the March 3, 2010, Order No. 1-01-18 of the Director of the Centre for Quality Assessment in Higher Education (December 20, 2010, Order No. 1-01-163 revision), *Degree-awarding undergraduate and integrated study program general requirements*, approved by the April 9, 2010, Order No. V-501 of the Minister of Education of the Republic of Lithuania and Science, etc.).

The assessment of the programme consists of two parts which complement one another. On the one hand the programme was assessed to be registered according to Lithuanian law which allows the programme to go into operation. For its registration the programme has to comply with the general requirements for study programmes as laid out in Order # V-501 and meet the assessment criteria for new study programmes as described in Order # 1-01-18. On the other hand the programme was assessed to receive **evalag**'s international label of study programmes. For this label **evalag** uses the European Standards and Guidelines for Quality Assurance in the European Higher Education Areas (part 1) and national criteria for programme assessment. In this case, in addition to the above mentioned orders, the criteria for existing programmes were used as described in Order # 1-01-162. The two sets of criteria are compatible insofar as the criteria for new study programmes are a subset of the criteria for existing programmes taking into account that some information may not be available for newly created study programmes.

The college produced the self-evaluation report according to the Lithuanian guidelines for new study programmes (yet-to-be implemented programmes) as outlined in Order # 1-01-18 and submitted it to **evalag**. **evalag** formed an expert team for the cluster consisting of four professorial experts and one student expert:

- Lena Diekhans, Karlsruhe Institute of Technology
- Prof. Dr.-Ing. Harald Garrecht, Technische Universität Darmstadt
- Prof. Dr. Jens Mischner, Fachhochschule Erfurt
- Prof. Dr. Schmidt-Gönnner, Hochschule für Technik und Wirtschaft des Saarlandes
- Prof. Dr.-Ing. Marina Schulz, Bauhaus-Universität Weimar

The site visit took place on 23 to 25 January 2012 at VTDK¹. During the site visit the expert team met with representatives of the three programmes, the college administration, students and teaching staff and visited the laboratories and seminar rooms used by the three programmes.

The expert team produced an assessment report of the programme with an accreditation recommendation which was submitted to **evalag**'s accreditation commission that took the final accreditation decision in March 2012.

From **evalag**'s side, the accreditation was coordinated by Harald Scheuthle with assistance of Katja Götzen.

4. Programme assessment

4.1 Learning outcomes

Current situation

The self-evaluation report describes programme goals and learning outcomes of the building engineering systems programme and links it with the curriculum. The learning outcomes describe both professional knowledge and competences as well as general/soft skills. The module handbook describes the learning outcomes and contents of each module or subject and gives detailed information on the content and working methods of the courses.

The programme intends to “impart knowledge, understanding, skills, and abilities necessary for a modern engineering systems specialist capable of designing and installing engineering systems and conducting maintenance of them and solving professional and societal problems under competitive market conditions” in order to educate specialist who are able to apply technological and scientific knowledge, to implement projects and work independently (self-evaluation report, p. 6). Furthermore, the programme intends to give its graduates a general education which enables them to creative thinking, independent problem solving, team work and independent professional development.

The programme was updated in 2010 in a project funded by the European Commission. Main goal of this project was to match the programme contents as much as possible to labour market demands and increase the competitiveness of the graduates

¹ Prof. Schulz was not able to attend the site visit.

and the Lithuanian economy as well as strengthening the cooperation with its European partners (self-evaluation report p. 10). By updating the programme, VTDK – according to the information in the self-evaluation report and given during the site visit – took into consideration the needs of the labour market. Therefore, VTDK conducts yearly employer surveys. Additionally the college cooperates with employers formally (i.e. employer representatives are on the college’s board) and informally through contacts between teachers and employers.

Graduates are mostly absorbed by the local and regional job market. VTDK competes mostly with Vilnius Gediminas Technical University, which offers university-level study programmes in the building engineering systems field. Depending on the economic situation, the graduates do not have – according to the college – any problems finding a job in their professional area.

Assessment

According to the expert team, the learning outcomes describe by and large well the contents and the qualifications offered by the programme. The learning outcomes clearly describe the professional orientation of the programme and meet the professional requirements of a graduate in the building engineering systems field. The learning outcomes on programme as well as on subject level are consistent with the college type studies and meet the required level of qualifications.

The programme goals also mention to educate specialists “capable of designing ... engineering systems” (self-evaluation report p. 6). The expert team, however, misses the appropriate subjects that impart the necessary competences for designing engineering systems. The expert team sees the main focus of the programme on installing and maintaining them. The study programme is situated on the professional college level targeted to a professionally and practically oriented education of the students. This implies that the programme does not cover the complete “scientific knowledge” of the field but rather focuses of “basic scientific knowledge”, necessary to understand the underlying concepts.

The expert team appreciates in principle that the college offers a general studies part in its study programmes to develop general education, creative thinking and language skills. The team, however, believes that the general studies part of the study programme could be more useful if its contents were specifically tailored to the needs of the future graduates.

Recommendations

The expert team recommends rephrasing the programme goals and learning outcomes of the building engineering systems programme by confining them to “basic scientific knowledge” or “technological knowledge” and avoiding the design competences of building engineering systems.

The expert team encourages the college to reconsider the emphasis of its general studies subjects and develop an offer of key competences courses customised to the professional needs of an engineer and to emphasise creative thinking of the students. This could include method competence courses (e.g. professional writing and presenting as well as project management for engineers), soft skill/social skill courses (e.g. team-oriented communication, conflict management, leadership skills) and courses which promote creative skills (e.g. technical drawing with regard to finding several adequate technical options/solutions for day-to-day construction work). These courses

could be offered as electives of the general studies part and, if necessary, adapted to all other study programmes of the college.

4.2 Curriculum design

Current situation

The curriculum is described in the self-evaluation report, the study plan and more detailed regarding content and working methods in the module handbook. The curriculum is based on a total of 180 ECTS credits which is equivalent to 4800 working hours. 15 credits are devoted to general college study subjects, 156 credits are devoted to study field subjects. Nine credits are devoted to free electives where students can choose from all courses offered by the college or even courses from other higher education institutions. The full-time programme covers six semesters with 30 credits each. The part-time programme lasts eight semesters with workloads of 21 to 24 credits.

The study field subjects include 48 credits of scientific basics for building engineering systems in the first three semesters. In the third semester start the module heating systems in buildings and the subjects covering the fields of water management, ventilation and energy as well as the subjects installation, maintenance and applied research which cover 60 credits altogether. The semesters three to eight cover additionally 12 credits of economics and law. The remaining 36 credits cover different internships (company internship and final practice) and the bachelor thesis.

The curriculum of the full-time programme has a high proportion of practice hours which reflects the practical and professional orientation of the study programme. Out of the 2399 contact hours, 1172 hours are devoted to laboratory work, 742 to lectures. The remaining hours are individual consultation hours and term papers. 2401 hours are devoted to independent work among which 420 hours are an industrial placement and 100 hours of final practice. The part-time programme has the same distribution of credits with a higher proportion of independent work.

The curriculum covers the main subjects of the building engineering systems field and gives the graduates a solid foundation of the field. The general college study subjects are not subject related and cover humanities and social science subjects as well as language competences.

Assessment

The expert team assesses the building engineering systems curriculum as well structured and logical. The subjects and modules are spread evenly and cover the relevant content and competences to meet the programme objectives and prepare the graduates for their professional tasks. The contents of the curriculum also reflect new developments in technology.

The experts appreciate the variety of learning methods used in the curriculum and especially commend the college for the high proportion of laboratory work integrated in the curriculum. During the site-visit, the expert team found out that the college offers – in cooperation with several faculties – a significant number of extracurricular and mostly interdisciplinary projects. The expert team values these projects as an excellent addition to the education of the students and a good opportunity for the professional development of the teaching staff.

The subject and module descriptions are mostly exemplary and give students and teaching staff a comprehensive overview over content, learning outcomes, working methods, assessment and workload of the subjects or modules. The description of the "Production Practice" subject, however, should be revised, as the nature of the internship is not clearly depicted in the description.

According to the expert team the curriculum meets the general requirements for study programmes as laid out in Order # V-501.

Recommendations

The expert team recommends integrating project work closer in the curriculum. So far, it seems that the projects offered by the college are mostly voluntary, extracurricular activities. These projects, however, should be offered as an integral part of the curriculum since they enrich the curriculum and will motivate students to apply their knowledge in practice on interdisciplinary tasks.

In terms of study contents, the expert team invites the college to consider slight adjustments to the curriculum. In the current curriculum subjects as building physics and building automation technology are, according to the expert team, underrepresented. These subjects are, however, relevant for the technological foundation of the field (building physics) and provide the students with important insights in relevant topics of modern building engineering systems (building automation technology). In turn, a subject such as geodesy could easily be reduced.

Regarding the free electives (nine ECTS credits) the expert team recommends to revisit this free selection opportunity due to the already tight curriculum design. Considering this aspect, the college may use these credits for subject-related electives or subject-supporting courses like the above mentioned key competences.

4.3 Teaching staff

Current situation

VTDK has a teaching staff of 20 persons in the field of building engineering systems. The majority of the teaching staff holds a Master degree or an equivalent. Four teaching staff members hold a Ph.D. title, three of them are associate professors of VTDK. According to the college, about 65% of the lecturers are employed full-time; the remaining 35% are part-time.

The activities of staff members are in principle confined to teaching. Research is not a primary task, as colleges are not supposed to engage in research activities. The college, however, encourages its staff to do applied research and supports projects proposed by staff members.

In general, professional development is the responsibility of each staff member, but the college also tries to support the professional development of its staff. Therefore, it attempts to acquire EU-funded projects in order to provide financial support for staff development. With these funds, lecturers can i.e. attend international or national conferences. Additionally, the college allows lecturers to make long-term internships in companies or acquire a second master degree in another field. The college is also engaged in Erasmus exchange programmes for teaching staff. Nevertheless, the lack of funding for staff development remains a general problem.

Teaching staff is evaluated by the college on a regular basis. The teachers write a yearly self-assessment report which is used for a gratification scheme. Every five years there is an assessment of each lecturer, which also takes into account the lecturer's efforts for their own staff development.

Assessment

The expert team assesses the staff as adequate in qualification to offer an professional college-level study programme and to provide the students with a qualified learning experience. They appreciate the motivation of the teaching staff met during the site visit. The number of teaching staff seems to be sufficient, also to support the newly introduced consultation hours. The students confirm that the teaching staff is easily accessible for them.

The expert team supports the decision of the college directorate to support staff development and encourages the college to provide funding for it.

The team acknowledges the low level of (applied) research at VTDK, which is to a large extent determined by the legal status of the institution and its associated tasks and opportunities. However, looking at the excellent laboratory equipment of the faculty, the team sees a potential for the faculty to strengthen and encourage applied research.

Recommendations

The expert team encourages the college to strengthen its applied research activities. The laboratory equipment of the faculty and its international network allows the teaching staff to engage in applied research. These activities could be used to enrich the education of its students by involving them in applied research.

4.4 Facilities and learning resources

Current status

The seminar rooms, computer rooms and laboratories for the building engineering systems study programme are listed in the self evaluation report and were visited by the expert team during the site visit. Altogether the study programme uses a total of 17 different seminar rooms and five laboratories for the different subject fields according to the self-evaluation report. The rooms and laboratories are shared with other study programmes. The computer rooms are equipped with the common software used in the field. The laboratories are equipped with modern laboratory equipment such as district heating systems, heating systems of buildings, water supply systems and pumps characteristics etc. which was funded by an EU financed project. The library offers textbooks and learning resources for the students and gives access to relevant journals in the field. Most textbooks or methodological publications are prepared by the lecturers and are available in sufficient numbers for the students in the library.

Assessment

According to the expert team, the facilities for the study programme are adequate in size and quality to provide a high level learning experience. The team commends the college to its excellent and modern laboratories which provide very good conditions for

the practical education of the students. The textbooks or methodological publications are very good, well structured and provide students good support in acquiring knowledge and competences in the respective subject matter. With its library facilities the students have access to the most relevant textbooks/publications necessary to complete their studies. Altogether the college is well equipped in terms of its facilities to offer the building engineering systems programme.

Recommendation

Although the college has very modern laboratory equipment, the expert team got the impression that the laboratories are not used to an appropriate extent. The team recommends a stronger integration of the laboratory equipment in the lab practices of the study programme. It suggests developing customised teaching units that make use of the laboratory equipment. Furthermore, it encourages the college to use the laboratories for its applied research, for interdisciplinary project work and to offer students the opportunity to use the laboratories for the preparation of their bachelor theses. This applied research could focus on the needs of the local social partners and could be carried out in cooperation with them. Furthermore the college could integrate its international partners in its applied research. To make full use of the laboratories it may be necessary to designate or employ technical staff in charge of the laboratory to instruct students how to properly use the equipment.

4.5 Study process and student's performance assessment

Current status

There are no specific admission requirements for the building engineering systems programme. For their enrolment students need to have a high school diploma with two state exams. For an admission at universities three state exams are necessary. The college informs during the site visit, that all applicants are accepted who meet the admission requirements as the college – same as other higher education institutions in Lithuania – suffers from a shortage of students. The study programme starts once a year in summer.

The programme is offered in a full-time option and a part-time option. The part time option offers the same content but is spread over four instead of three years to allow students to work during their studies. The part-time programme offers the courses in three blocks at the beginning, in the middle and after the end of the regular semester, with a larger portion of independent work.

The study process is organised in groups of approximately 30 students. In the building engineering systems programme the college started with one group in the full-time programme with a total of 28 students and one group of 20 students in the part-time programme.

The study process offers a variety of working methods such as lectures and seminars, laboratory work, independent home assignments, consultation hours and independent work. The teaching methods and its distribution are listed in detail for each module / subject in the module handbook.

Each subject ends with a student assessment. The final subject assessment is composed of at least two different assessment forms and combined according to a predefined formula. This leads to a variety of different examination methods, i.e. written exams, tests, practical works, project reports, independent work, which assess different

competences. The assessment methods and formulas to create the final mark are described in the module handbook. The individual marks are assessed and processed by the lecturer of the subject and the final mark is submitted to the college administration.

Drop-out rates (in the previous building engineering systems programme) were at about 50%. According to the college this is about the average drop-out rate in Lithuania. The renewed building engineering systems programme has now a larger proportion of individual consultation hours which may contribute to reduce the drop-out rates.

The study programme includes – among other shorter internships or practical placements – a 12 week internship (18 credits) at a company. The students search the companies independently but in case of need, the college provides support through their company contacts. Before the internship, the student, the company and the responsible lecturer agree on the task that should be performed during the internship.

The bachelor thesis is mostly written at the college under the supervision of a lecturer; however, the final practice may be used to collect data in a company to prepare the thesis.

Students have the opportunity to participate in mobility programmes. The college takes actively part in the Erasmus programme and has, especially for the building engineering systems programme, partner institutions in Denmark and France. The number of incoming students, however, is low, as the college does not yet offer courses in English. Therefore a module taught in English with 16 credits is planned.

After finishing their studies the majority of the students search – mostly successfully according to the information of the college – a job in their profession. About 20% seek a Master degree. In order to meet the admission requirements for a Master programme at a Lithuanian university the students with a professional bachelor degree need to attend one and a half years of bridge courses.

Assessment

To the expert team the study process of the building engineering systems programme seems to be well organised and balanced. The organisation of the study process seems to be adequate to achieve the intended learning outcomes. This assessment is also confirmed by the students during the site visit who were in general satisfied with their situation at the college and appreciate VTDK due to its good reputation. The students especially emphasised the easy and close contact with their lecturers. The assessment scheme is transparently described and uses multiple assessment methods to check different competences of the students. The study programme documents and module handbook are available on the college's website.

The college also offers its students opportunities for international mobility. The expert team encourages the college to strengthen these mobility programmes and to further motivate students to participate in student exchanges. Therefore, the existing partnerships could be used. Furthermore, the experts emphasise the importance of English courses for local students. One necessary precondition to increase mobility is to provide favourable conditions for incoming mobility. Therefore, the experts see it as indispensable to offer courses in English in order to increase the attractiveness of the college for foreign exchange students.

Students have some opportunities to engage in applied research, mostly through extracurricular projects offered by the lecturers. The expert team believes, however, that the college could further integrate research oriented elements in the study process and encourage students to engage in applied research.

The academic and social support of the students seems to be appropriate. The students report a clearly structured but also tight study process and are in general satisfied with their situation at the college. Lodging seems to be no problem, also due to the good supply of student housing by the college.

The expert team notices the high drop-out rates of the study programme and encourages the college to take appropriate measures to reduce them. One possibility which is seen very positively by the experts is the introduction of consultation hours in the renewed study programme. These consultation hours may help addressing individual problems of the students and support them to progress in their studies if needed.

Due to the close cooperation with employers in designing the study programmes and during the practical periods during the programme, the students are mostly able to find appropriate jobs in their profession. The students mentioned during the site visit that finding a job does not seem to be a big issue for them as they see themselves well prepared. Due to the professional profile of the study programme the possibilities for continuing education are limited as bridge courses are necessary to start a master programme at a university.

Recommendations

The experts recommend the college to strengthen opportunities for students to engage in applied research. The excellent laboratory facilities and the good relations to local companies provide good conditions for applied research. This could be done e.g. by integrating research oriented projects into the curriculum or by supporting research oriented bachelor theses. Furthermore, the subject "Applied research" could be linked with another subject in order to systematically integrate applied research projects in the curriculum and to allow students to apply the research methods on projects related to their field of studies.

In order to encourage and strengthen international mobility of the students the experts recommend strengthening the English language education of the students and offering courses in English in order to attract foreign exchange students.

4.6 Programme management

Current status

Each study programme is run by a committee, which is related to the faculty. The programme committee includes lecturers and students. It is responsible for the yearly improvement of the programme and coordinates the programme related quality assurance activities. The college has a council with representatives from the social partners.

For programme improvement the college builds on initiatives of its lecturers, results of the quality assurance instruments and its close contact with its social partners. The recent programme renewal was carried out in close cooperation with employers in order to customise the programme content to the needs of the labour market.

On programme level the department carries out student course evaluations. The results of the evaluations are analysed and discussed in the department or, if needed, between a lecturer and the dean. The results are also presented to the students during special information meetings.

On college level, there exists a quality assurance office that supports the faculties and study programmes in their quality assurance efforts. The college also provides a qual-

ity handbook that describes the most relevant processes. Currently the college carries out an EU-funded project to redesign its internal quality assurance system and to develop a quality management system based on a combination of EFQM and ISO. In this project the college will also define strategic performance indicators for its faculties.

Assessment

The expert team assesses the programme management as clearly structured and efficient. The experts appreciate the good involvement of external stakeholders in the improvement of study programmes. The quality assurance of the programme seems to be straightforward. The experts commend the college on its efforts to improve its internal quality management system in an EU-funded project and support the college to fully implement the results of this project. As the project is not yet implemented the quality management system cannot be fully assessed at this stage.

Recommendations

The expert team recommends the college using the opportunity of the EU-funded quality assurance project to design and implement an integrated strategic quality management system that builds on the strategic objectives of the college and the study programmes, uses diverse sources of information to analyse the quality and derives and implements measures for improvement. The college needs to assure that the quality management system supports the lecturers in providing a good learning experience and reduces bureaucracy.

To fully use the capacities of the already build up quality management system the experts invite the college to use statistics more systematically in its internal quality assurance processes.

5. Overall assessment

In general the expert team assesses the professional bachelor study programme “Building Engineering Systems” positively. The college provides a solid education and prepares the students well for their future profession. The professional character of the programme is clearly described in the learning outcomes. Curriculum and study process are clearly structured and appropriate to achieve these learning outcomes. The programme management and the quality assurance seem to be appropriate to manage and improve the programme. The expert team values the close cooperation of the college with regional and local employers in order to support the study process and to constantly develop the study programme and focus the competences of the graduates to the needs of the labour market. A great asset of the college is its motivated teaching staff and its excellent laboratory equipment. The efforts of the college in providing good learning opportunities are also valued by the students.

The expert team sees the main area for development in setting up its potential for applied research and to integrate it further in the study programmes. This should be especially a priority of the college and the programme management as it disposes of the necessary laboratory equipment. By strengthening the applied research the college will be able to further improve the learning experience and the competences of its graduates and serve its social partners in additional ways.

According to the expert team the renewed building engineering systems programme meets the Lithuanian requirements for programme accreditation. Therefore, the team recommends the programme for accreditation.

The expert team also recommends awarding the **evalag** label for programme accreditation as the programme meets the Lithuanian evaluation criteria for study programmes on which the label is based. The team recommends the college to consider and implement the recommendations in this report to further improve the programme.

6. Decision of the Accreditation Commission

The accreditation commission of **evalag** accredited the professional bachelor programme “Building Engineering Systems” of Vilnius technologijų ir dizaino kolegija (VTDK) and awarded the **evalag** label for programme accreditation. The accreditation is valid **from March 2012 until August 2015**.

To further improve the study programme the accreditation commission affirms the recommendations given by the expert group.