



STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

KAUNO TECHNOLOGIJOS UNIVERSITETO
STUDIJŲ PROGRAMOS TERMOINŽINERIJA
(*valstybinis kodas – 621E30001*)
VERTINIMO IŠVADOS

EVALUATION REPORT
OF THERMAL ENGINEERING
(*state code – 621E30001*)
STUDY PROGRAMME
at KAUNAS UNIVERSITY OF TECHNOLOGY

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Vilnius
2015

DUOMENYS APIE ĮVERTINTĄ PROGRAMĄ

Studijų programos pavadinimas	<i>Termoinžinerija</i>
Valstybinis kodas	621E30001
Studijų sritis	Technologijos mokslai
Studijų kryptis	Energijos inžinerija
Studijų programos rūšis	Universitetinės studijos
Studijų pakopa	Antroji
Studijų forma (trukmė metais)	Nuolatinė (2 metai)
Studijų programos apimtis kreditais	120 ECTS
Suteikiamas laipsnis ir (ar) profesinė kvalifikacija	Energijos inžinerijos magistras
Studijų programos įregistruavimo data	Lietuvos Respublikos švietimo ir mokslo ministro 2007 m. vasario 19 d. įsakymu Nr. ISAK-225.

INFORMATION ON EVALUATED STUDY PROGRAMME

Title of the study programme	<i>Thermal Engineering</i>
State code	621E30001
Study area	Technological Sciences
Study field	Energy Engineering
Type of the study programme	University studies
Study cycle	Second
Study mode (length in years)	Full-time studies (2 years)
Volume of the study programme in credits	120 ECTS
Degree and (or) professional qualifications awarded	Master of Energy Engineering
Date of registration of the study programme	19 th February 2007, under the Order of the Minister of the Ministry for Education and Science of the Republic of Lithuania No. ISAK-225.

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The Centre for Quality Assessment in Higher Education

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I. INTRODUCTION

1.1. *Background of evaluation process*

The evaluation of on-going study programmes is based on the **Methodology for Evaluation of Higher Education Study Programmes**, approved by the Order No. 1-01-162 of 20th December 2010 of the Director of the Centre for Quality Assessment in Higher Education (hereafter, SKVC). Evaluation is intended to help higher education institutions to constantly improve their study programmes and to inform the public about quality of studies.

The evaluation process consists of the main following stages: *1) self-evaluation and the Self-evaluation Report prepared by a Higher Education Institution (hereafter, the HEI); 2) a visit of the Review Panel at the higher education institution; 3) preparation of the evaluation report by the Review Panel and its publication; 4) follow-up activities.*

On the basis of the study programme external evaluation SKVC takes a decision to accredit the study programme either for 6 years or for 3 years. If evaluation of the programme is negative such programme is not accredited.

The programme is **accredited for 6 years** if all evaluation areas were evaluated as “very good” (4 points) or “good” (3 points).

The programme is **accredited for 3 years** if none of the areas was evaluated as “unsatisfactory” (1 point) and at least one evaluation area was evaluated as “satisfactory” (2 points).

The programme is **not accredited** if at least one of evaluation areas was evaluated as “unsatisfactory” (1 point).

1.2. *General*

The application documentation submitted by the HEI follows the outline recommended by SKVC. Along with the Self-evaluation Report and Annexes, the following additional documents have been provided by the HEI during the site-visit:

No.	Name of the document
1.	Samples of examination papers
2.	Samples of semester and diploma project reports (“theses”)

1.3. Background of the HEI/Faculty/Study field/Additional information

The mission of Kaunas University of Technology (hereafter, KTU) is defined in a way similar to those of European leading universities. The SER states that “Mission of Kaunas University of Technology is to provide research-based studies of international level,” that “Vision of Kaunas University of Technology is to be a leading European university,” and that the “Structure and staff activities of the University are oriented towards research and innovations in the area of fundamental sciences and technologies.” KTU seems to be well linked internationally. The Panel notes with satisfaction that “Funds from international research programmes comprise 25 percent of KTU's annual research budget; 46 percent of R&D capital comes from foreign companies (2013).” The structure of the University resembles that of similar institutions in Europe and overseas. The study programmes have been converted from the former Diploma to the European Bachelor-Master's scheme.

The *Thermal Engineering* programme (hereafter, the Programme) is run by the *Department of Thermal and Nuclear Energy* since 1990.

The SER states that “the *Thermal Engineering* study programme is oriented towards analysis and design of thermal systems and technologies.” In depth studies are in the four specialization areas of *Thermal Power Engineering*, *Renewable Power Technologies*, *Fuel Engineering*, and *Thermal Technologies*.

This second cycle Programme at KTU is similar to those of other European universities; specializations of course differ.

The Programme is designed to satisfy the advanced educational needs of a well defined industry: thermal energy engineering. The future employers are well identified based on the current and forecasted situation in this sector of the Lithuanian economy. It is estimated that the industry of Lithuania will need at least 20 to 30 graduates of this *Thermal Engineering* programme per year.

In general, the SER is comprehensive and detailed. It gives a detailed description of the situation in the Programme, but provides relatively little “evaluation” (criticism, approval, ...). It tends to often show compliance with applicable Regulations rather than assess the quality or discuss the situation. Occasionally, the SER states that requirements are met without specifying numbers, etc.

With some necessary exceptions, the present report does not repeat or summarize publicly available information from the SER; comments are made here if the Panel disagrees or does not fully understand certain statements or if weaknesses of the SER are detected.

As the Review Panel (the Panel) reviewed both the first and second cycle programmes in the thermal engineering area at KTU and certain meetings were common for both programmes, the reader will find a number of identical or quasi-identical sections in the two corresponding reports.

1.4. The site visit of the Review Panel

The Panel met with the Evaluation Coordinator and her collaborators at the SKVC headquarters in Vilnius the morning of Monday, October 12 for an introductory meeting. In the afternoon of October 12 the Panel had an internal meeting to discuss the SERs and prepare the forthcoming visits. At the end of the day, it moved to Kaunas.

On Tuesday and Wednesday, the Panel visited the *Department of Thermal and Nuclear Engineering* to evaluate both the first and second cycle programmes in *Thermal Energy and Technology* and *Thermal Engineering*, respectively. The Panel had meetings with senior management and Faculty administration staff, the teaching staff, students, alumni and employers and social partners. The schedule of the visits is given in the following Table. At the end of each day, after a private Panel discussion, the Chair of the Panel summarized the first impressions to the university community.

The members of the Review Panel had during their visits and the various meetings professional, open and cordial discussions with the administrative and teaching staff. They are indebted to the Department for the hospitality extended to them and to SKVC and the Coordinator for the good organisation of the evaluation.

12th October, Monday

SKVC office, A. Goštauto St. 12, Vilnius

Introductory meeting at SKVC to discuss:

- 10.00 – 12.00
1. Higher Education System in Lithuania;
 2. Evaluation and Accreditation of Study Programmes;
 3. Methodological Guidelines. Visits. Final Reports.

13.20 – 16.00 Panel meeting, discussion about the SERs, preparation for the visits, etc.

13th October, Tuesday

Visit at Kaunas University of Technology

09.00 – 10.15	Meeting with senior management and faculty administration staff (evaluation of four study programmes: <i>Thermal Energy and Technology</i> , <i>Thermal Engineering</i> , <i>Nuclear Energy (BA)</i> , <i>Nuclear Energy (MA)</i>)
10.20 – 11.05	Meeting with staff responsible for the preparation of the SER (evaluation of <i>Thermal Energy and Technology</i> study programme)
11.30 – 13.00	Meeting with teaching staff (evaluation of two study programmes: <i>Thermal Energy and Technology</i> , <i>Thermal Engineering</i>)
13.05 – 13.50	Meeting with students (evaluation of <i>Thermal Energy and Technology</i> study programme)
15.00 – 15.30	Review of students' term and final papers (theses), examination material (evaluation of <i>Thermal Energy and Technology</i> study programme)
15.35 – 16.20	Meeting with alumni (evaluation of <i>Thermal Energy and Technology</i> study programme)
16.25 – 17.10	Private Team discussion and finalisation of the visit
17.10 – 17.25	Introduction of general remarks of the visit to the University community

14 th October, Wednesday	Visit at Kaunas University of Technology
09.00 – 09.45	Meeting with staff responsible for the preparation of the SER (evaluation of <i>Thermal Engineering</i> study programme)
09.50 – 10.35	Meeting with students (evaluation of <i>Thermal Engineering</i> study programme)
10.40 – 12.10	Visiting classrooms, lecture halls, libraries, laboratories, other facilities (studios, teaching spaces, computer rooms, etc.) (evaluation of 4 study programmes: <i>Thermal Energy and Technology</i> , <i>Thermal Engineering</i> , <i>Nuclear Energy (BA)</i> , <i>Nuclear Energy (MA)</i>)
13.20 – 13.50	Review of students' term and final papers (theses), examination material (evaluation of <i>Thermal Engineering</i> study programme)
13.55 – 15.25	Meeting with employers and social partners (evaluation of 2 study programmes: <i>Thermal Energy and Technology</i> , <i>Thermal Engineering</i>)
15.30 – 16.15	Meeting with alumni (evaluation of <i>Thermal Engineering</i> study programme)
16.20 – 17.05	Private Team discussion and finalisation of the visit
17.05 – 17.20	Introduction of general remarks of the visit to the University community

1.5. The Review Panel

The Review Panel was composed according to the *Description of the Review Team Member Recruitment*, approved by the Order No. 1-01-151, 11/11/2011 of the Director of the Centre for Quality Assessment in Higher Education. The visit to the HEI was conducted by the Panel on October 13-14, 2015. The composition of the Panel is given below.

1. Prof. George Yadigaroglu (Chair of the Review Panel)

Professor emeritus at ETH-Zürich, Switzerland.

2. Prof. Andres Siirde

Professor at Tallinn University of Technology, Estonia.

3. Dr. Simon Walker

Reader at Imperial College London, United Kingdom.

4. Dr. Rolandas Urbonas

Deputy Director at Lithuanian Energy Institute, Lithuania.

5. Ms Julija Baniukevič

Doctoral candidate of Physical Sciences at Vilnius University, Lithuania.

II. PROGRAMME ANALYSIS

Introductory general remarks

The SER states that the aim of the study programme *Thermal Engineering* “is to provide deeper knowledge in thermal engineering, develop abilities, skills and competencies necessary to function effectively in developing components and technologies in the field of thermal energy, carry out research and management tasks, perform analysis, design and control of thermal systems and develop abilities to communicate and cooperate with professionals and non-professionals.”

The Review Panel was impressed by the extremely close, long-time collaboration between industry and the Programme. Most of the teaching staff holds degrees from KTU. This close collaboration evidently results in graduates that are immediately employable by the industry that is eager to hire them. The closed circle of all stakeholders, faculty, students, alumni and employers were very pleased with this situation. The Programme contains the engineering subjects that all partners see as useful within the scope of thermal engineering. The graduates that the Panel met were very satisfied with the education they obtained and with their industry positions. They did not have strong aspirations for more challenging positions.

The Panel became concerned that from a broader educational point of view this very close connection to a single industrial sector was encouraging and concealing some failings and lost opportunities. The Programme has set itself limited aims, of meeting the needs of a single, rather narrow industrial sector. It is doing this very well, but in doing so the Panel believes it is failing to “educate” students, in the true and full, broader meaning of this term; a broader education may have better prepared the students to meet future unforeseen challenges.

2.1. Programme aims and learning outcomes

A great amount of effort is devoted in the SER to define intended learning outcomes at Programme as well as study subject levels and link these to the contents of the subjects. However, the intended learning outcomes are often too general and occasionally obvious (e.g., essentially repeating the name of the specialization area as in intended learning outcomes A1: “Has in-depth knowledge and understanding of the principles of energy engineering”, and A2: “Has critical awareness of the essence of energy engineering”) and do not describe sufficiently the subjects and their level. Some details of the subjects taught can be found, however, in the list of contents, the *Syllabus*, of the particular subjects in the Appendix on the *Study Modules*. The

Review Panel felt that it would have been better to concentrate the effort on the more detailed definition of the table of contents of the subjects and their relationship to providing to the students the knowledge and skills required for thermal engineering. This would have enabled comparisons of this particular curriculum to similar international ones. Table 2.3 of the SER is very challenging to read.

Subject to the above general observations:

The Programme aims and intended learning outcomes are defined and are publicly accessible in both English and Lithuanian, although improvements in defining details and more specific outcomes would be welcome.

The Programme aims and intended learning outcomes are based appropriately and clearly on the academic and professional requirements, public needs and the needs of the labour market. With the limitations (breath of education) noted above, the Programme meets very well the needs of the closed circle: local industry-employers-faculty-students-alumni.

The Programme aims (though limited) and intended learning outcomes as defined are consistent with the type and level of studies and the level of qualifications offered. The definitions of the lower-level intended learning outcomes in the subjects (given in the Annex) should be restated for completeness and to avoid occasional emphasis in one particular area for no obvious reason. The *Syllabi* give more useful information, but the choice of topics covered in the lectures may be somewhat arbitrary.

The name of the Programme is broad but the Programme itself necessarily cannot cover all aspects of thermal engineering that is a very broad discipline.

In summary, as stated above, the Programme is designed to meet the needs of a subset of national industries and as such, its intended learning outcomes, content and the qualifications offered are compatible with each other.

2.2. Curriculum design

The design of the curriculum meets the legal requirements. The volume of the study programme consists of 120 ECTS, which is in compliance with the Order of the Minister for Education and Science of the Republic of Lithuania 03/06/2010 No. V-826. The duration of studies is four semesters. Out of 120 ECTS of the study programme 66 ECTS are for core subjects of the study field (should be at least 60 ECTS), 24 ECTS – elective subjects undertaken by the student

(should be no more than 30 ECTS) and the final degree thesis contains 30 ECTS (should be no less than 30 ECTS).

The study subjects are spread evenly over semesters and their themes are generally not repetitive. However, the names of the study subjects on *Thermal Energy Engineering* and *Thermal Technologies* are similar and do not clearly identify their contents.

The core subjects to some extent complement the subjects offered in the first cycle. The Programme has four specialization directions (or *modules*): *Fuel Engineering*, *Renewable Energy Technologies*, *Thermal Energy Engineering* and *Thermal Technologies*. The Panel learned, however, that only the *Thermal Energy Engineering* specialization was offered during the current academic year. There seem to be some arbitrariness in the names of the specialization areas and the choices made and possible or even necessary overlaps in subjects that cover similar grounds in different specializations. Putting the specialization subjects in a pool from where the students could chose and build their specialization area would have allowed elimination of such overlapping subjects. The Panel recommends considering this alternative. The Panel was pleased to read, however, in the SER (par. 451): “Factors of improvement: Content of selective modules in the study programme will be revised in modules certification process seeking to eliminate content overlaps and to optimise program by decreasing number of separate subjects jointing them together.”

The content of the subjects is mostly consistent with the type of the studies, the content and methods of the subjects are appropriate for the achievement of the intended learning outcomes and the scope of the Programme is sufficient to ensure the achievement of the intended learning outcomes within the limits about the specialization of the Programme noted above.

The statement in the SER (par. 47): “The themes of Final Degree projects are oriented towards the solution of technological and scientific problems at Lithuanian and also foreign companies in the sector of thermal engineering” is certainly a good practice to be further encouraged.

The Programme meets the needs of the stakeholders mentioned above within its niche, but cannot necessarily address all the latest achievements in science and technologies. By design, it may not provide the broader educational basis and the independent and innovative-thinking abilities needed to address new areas of thermal technologies as also stated in the Introductory General Remarks.

The contents of the Programme are adequate but, according to their level, some of subjects could have been offered in the first cycle, except maybe for lack of space there. Mentioning as examples and not exhaustively: *Heat Transformation*, *Processes of Heat Transformation*, *Refrigerating Systems*, etc. to name a few.) As stated above, the Programme is designed to meet the needs of a subset of national industries and as such, its intended learning outcomes, content and the qualifications offered are compatible with each other. The Programme looks more like an extension of the first cycle rather than a second cycle, advanced programme.

2.3. Teaching staff

According to the Order of the Minister for Education and Science of the Republic of Lithuania 03/06/2010 No. V-826, “No less than 80% of the teaching staff shall have advanced degrees of which no less than 60% shall engage in research in the same area as the subject they teach. If the study programme is oriented towards practical activities, up to 40% of the staff teaching the main subjects may consist of persons with at least a three-year practical experience in the area of the applied subject they teach gained within the past 7 years. Professional experience referred to above is a must for the teaching staff of applied subjects. No less than 20% of the subjects in the main field of studies shall be taught by full professors.”. According to the SER, the Programme teaching staff (co-ordinators of the study subjects) consists of four professors and nine associated professors – all of them with doctoral degrees (should be not less than 80 %). The scientific activities of all of teachers correspond to the subjects taught (should be not less than 60 %). Almost 25 % of main subject lectures (not including research projects and the final degree project that are coordinated by different supervisors) are taught by professors (should be not less than 20 %). Depending on the students’ selection of the selective subjects, the percentage of the subjects taught by professors could rise up to 40 %.

The number of teaching staff is sufficient and adequate to ensure the achievement of the intended learning outcomes.

Regarding the age distribution of the staff, 54 % of the Programme teachers are above 61 years old, including three out of the four professors. The teachers who are above 50 years old constitute 85 % of the staff, according to the SER. The statement in the SER (par. 69) “Search for possibilities to engage young lecturers in The Department of Thermal and Nuclear Energy” is in the right direction considering, however, the remark about avoidance of in-breeding is made at the end of this section.

The majority of study subjects co-ordinators have one other teaching staff (doctoral student, lecturer or associated professor) assisting them. In the vast majority of cases, senior subject co-ordinators have younger assisting teachers.

The Department of Thermal and Nuclear Energy, which is co-ordinating the Programme, has five doctoral students. In the discussions with the teachers of the Programme, it was found that only five teachers of the *Department of Thermal and Nuclear Energy* were accredited to have doctoral students, (i.e., according to the rules, in the last five years had published three articles in journals referred to in the Thomson-Reuters WoS database). The SER authors group stated that rather soon the number of such teachers will reach ten, since a number of their publications are submitted or accepted in journals. On the other hand, none of the Department staff (also taking into account age limitations) is currently eligible to participate in doctoral-degree defence committees, where the requirement is to have in the last five years five articles published in journals referred to in the Thomson-Reuters WoS (with some additional qualifications). These observations (based on information provided in the SER and its annexes) show that rather limited research is done, as also reflected in the small number of publications.

The Panel wishes to remind here that one distinction between technical training and broad scientific education is that scientific education is best provided by academics active in research in their areas of teaching. In this respect the Panel strongly recommends that the staff teaching the second cycle subjects be much more involved in research.

The University provides opportunities for professional development (traineeship or work as associated researcher at foreign study and research institution, traineeship at industrial enterprises and organizations; courses, seminars, and other events for professional development.) The SER states that “all lecturers of the programme developed their qualification in the period of the last 5 years by using the above mentioned means.” No details were provided regarding the extent and the scientific level of these activities. The SER states as “Weakness” that “relatively low number of lecturers participate in international academic exchange programmes;” The Panel recommends more horizon-broadening visits to European educational institutions, sabbaticals abroad and similar activities that go beyond the simple enhancement of personal and teaching skills (the SER lists as such “professional English, methods of studies quality assurance, methods of e-learning, preparation of scientific publications, different presentations and training on usage of scientific equipment, etc.”)

Review Panel Recommendation: the renewal of the faculty could be an opportunity to hire new younger faculty with broad interests in general and strong research interests in particular. The Department is facing the challenge of creating the conditions for attracting such individuals, in particular from other institutions of higher learning to avoid excessive in-breeding.

2.4. Facilities and learning resources

The Department is located in partly renovated, pleasant facilities. The Review Panel visited several laboratories and one classroom and found that the laboratories are sufficient in size, as well as quality.

Most of the laboratories are situated in the new campus, except for the *Fuel Combustion Laboratory* and the *Laboratory of Fuel Engineering Systems* that are still located in the old facilities. These two laboratories are also used for research by the staff of the Department. The equipment of these includes solid- and gas-fuel small-scale boilers; there is also relatively new measuring equipment like fuel gas analyzer, a temperature controller etc. There were also laboratories that were not updated with new equipment and the SER mentions this as a weakness. The modernization plan covered in the SER lists corrective measures for that.

The SER mentions that students of the Programme have the possibility to use a good number of classical software such as Matlab. There is also software suitable for engineering design projects such as AutoDesk, SolidWorks, etc. The Panel had a chance to observe some of these while visiting the laboratories.

The students can use both the University and the Faculty libraries. There is a possibility to access a number of scientific databases (such as ScienceDirect.)

The teachers of the *Thermal Energy and Technology* and *Thermal Engineering* programmes had prepared 30 textbooks and other teaching materials that the Panel could partly see when visiting the library of the Faculty.

In summary, the laboratory equipment is a mix of modern and some older, but pedagogically valid equipment. The library is well equipped and has access to electronic media. The students have access to a sufficient number of software packages. There is room for the students to study. The teaching materials are generally adequate and accessible.

2.5. Study process and students' performance assessment

The number of students admitted to the Programme has increased the last few years. The numbers of entering students in the years 2010-2014 are: 11, 8, 8, 16, and 20. The SER states that the lecturers of the Programme use various means and methods to attract students to the Programme such as leaflets, videos and other materials and information for presentations at annually organized events for first-cycle students, etc. All the students entering the second cycle are KTU graduates; the second-cycle Programme has not attracted students from other universities.

The organisation of the study process ensures an adequate provision of the Programme and the achievement of the intended learning outcomes.

It is desirable that students are encouraged to participate in basic and applied research activities. However, this was not demonstrated to the Panel. The Panel commented elsewhere on the desirability of greater involvement in relevant research by the staff teaching this Programme and this is anyway perhaps a pre-requisite for the involvement of students in this.

Students have opportunities to participate in student mobility programmes, but none has participated according to the SER. The SER states that the reason is “that Lithuanian students are employed in companies and don't want to leave for the whole semester.” The faculty cannot of course enforce involvement, but perhaps greater encouragement towards it could be given.

The Panel concluded that there was an adequate level of academic and social support provided to students, largely based upon their generally positive responses to the Programme, and on the absence of any comments from them about a lack in this regard.

The assessment system of students' performance is clear, adequate and publicly available, although the processes and quality assurance associated with the setting of examination papers was not of the standard comparable to best practice in certain higher education institutions elsewhere, in particular in the UK. The Panel learned from the students and alumni that they consider examinations as fair and adequate. The weighted average of the evaluation of the Final degree project around 10 is unrealistically high.

The graduates of this Programme are readily absorbed in the relevant industries. The Panel was pleased to learn that both employers and employees were very satisfied. They felt that their education provided them the right tools. The professional activities of the majority of graduates meet the Programme providers' expectations.

2.6 Programme management

In general Programme management seemed appropriate. In particular, responsibilities for decisions and monitoring of the implementation of the Programme are clearly allocated. The management of the Programme is carried out in accordance with the Statute of KTU approved by decision Nr. XI-1194 of 30 October 2010 of the Chairman of the Parliament and the “Temporal Academic Regulamin” of KTU. The Programme administration and quality assurance are managed by the Vice-Rector for studies with the help of the Department of Academic Affairs. The Programme is constantly improved and updated by the Study Programme Committee for Electrical and Electronical Engineering, Environmental Engineering and Energy Engineering Study Programmes which has eleven members including three representatives of employers and three representatives of students. There is a designated Manager of the study programme who carries responsibility for the content and quality of the study programme.

According to the SER, the responsibilities for decisions and monitoring of the implementation of the Programme are clearly allocated and information and data on its implementation are regularly collected and analysed. Constant quality assessment of the Programme is carried out in compliance with KTU Guide of Quality. The Study Programme Committee mentioned above cooperates with the Senate Studies and Academic Culture Committee and the Department via the Co-ordinator of the Programme and takes into account their proposals in decisions regarding renewal of the Programme or study subjects and preparation of new ones. Changes of the Programme are discussed and approved by the Faculty Council consisting of 15 members.

The Study Programme Committee presents its proposals which are agreed with the Faculty Council to the Department of Academic Affairs which summarizes propositions and presents them for approval to the Reactor’s Office and the University Senate.

The Study Programme Committee certifies study subjects. It appoints reviewers for evaluation of the prepared methodological and educational materials and makes recommendations regarding their status.

The proper conduct of the Programme and its improvements are ensured by the Programme Manager – a professor of the *Department of Thermal and Nuclear Energy*. The quality of study subjects is assured by the teachers/coordinators of these subjects. The process of the Programme administration and its quality assurance are available in the University Academic Information

System. The outcomes of internal evaluations of the Programme are used for the improvement of the Programme.

There are systematic student evaluations of the subjects and teachers for all subjects, but the Department is not satisfied with the low response rate (about 30% of students taking the subject).

The Panel recommends that ways be found to increase the participation in the study subjects' evaluations by the students. It also recommends that the (anonymous) evaluation results be presented to the class by the teacher and discussed.

The evaluation and improvement processes involve stakeholders, and indeed more generally the close connections that evidently exist between the faculty and the relevant local industry are notable and good. As examples of useful cooperation, one notes that, the problem of low numbers of entering students was addressed cooperatively with industry; employers take active part in the event "Career days" organized by KTU; the study process is continuously improved in cooperation with the energy and industrial companies, scientific research centres, professional associations and foreign partners; etc.

The internal quality assurance measures for the Programme are described (in the SER) as effective and efficient. They seem, however, to rely mainly on bureaucratic measures and may be missing in-depth academic-quality assessments of the study subjects, teachers and teaching methods.

III. RECOMMENDATIONS

Recommendations were made throughout this report; they are repeated here.

1. The Review Panel recommends revising the study programme aims and intended learning outcomes and make these much more specific and related to the study programme.
2. The Panel recommends considering the alternative of putting all the specialization subjects in a pool from where the students could chose and build their specialization area. This will allow elimination of any overlaps in the subjects and enlighten the teaching effort.
3. The Panel wishes to remind here that one distinction between technical training and broad scientific education is that scientific education is best provided by academics active in research in their areas of teaching. In this respect the Panel strongly recommends that the staff teaching the second cycle subjects be much more involved in research. Links with the neighbouring Lithuanian Energy Institute could be further reinforced.
4. It is desirable that students are encouraged to participate in basic and applied research activities. Increased involvement in research by the staff will also provide more such opportunities for the students.
5. The Panel recommends more staff visits to European educational institutions, sabbaticals abroad and similar activities that go beyond the simple enhancement of teaching skills.
6. Students should be encouraged to increasingly use the available opportunities to participate in student mobility programmes.
7. The renewal of the faculty could be an opportunity to hire new younger faculty with broad interests in general and strong research interests in particular. The Department is facing the challenge of creating the conditions for attracting such individuals, in particular from other institutions of higher learning to avoid excessive in-breeding.
8. The Panel recommends that ways be found to increase the participation in the subjects evaluations by the students. It also recommends that the (anonymous) evaluation results be presented to the class by the teacher and discussed.

IV. EXAMPLES OF EXCELLENCE

The Review Panel was impressed by the extremely close collaboration between industry and the Programme that led to general satisfaction of all stakeholders: teaching staff, students, alumni, and employers. (Additional discussion on this matter can be found in the *Introductory General Remarks*).

V. SUMMARY

The SER is complete and detailed. It shows that the teaching staff is aware of certain weaknesses and limitations and tries to find solutions. The SER has, however, a rather formal and bureaucratic attitude in showing compliance with a multitude of national regulations and provides a limited evaluation of the academic *quality* of the Programme, of the teaching staff and of the subjects.

The Department hosting this Programme has a structure and operates in ways similar to those of other European institutions of higher learning. The Programme is formally also similar in content and structure to those of other European universities.

The Programme meets the regulatory requirements.

The Programme is very functional in meeting the needs of a specific sector of local / national industry (district heating, heating and cooling, etc. and related areas), but, consequently, it is rather narrow. It seems unlikely to encourage students to raise their educational horizons, as a university education in principle should. The students on the Programme are KTU first-cycle graduates; no students from other universities joined the Programme.

The Review Panel was disappointed to learn that only about 1/3 of the staff met the criteria allowing accreditation to supervise doctoral students. The staff is clearly able to teach the limited-objective subject that they provide, but the lack of research activities contributes to the failing above.

The fact that 54 % of staff are over 60 years old, and 85 % are aged over 50, is not optimal. There is strong in-breeding of the teachers, as their great majority has studied and spent their entire academic career at KTU. A vigorous and effective recruitment activity is needed to diversify and broaden the backgrounds of the staff and ensure that the Programme is able to deliver its current relatively narrow objectives as well as enlarge its scope to meet future challenges. The Programme does not fit the top-level mission of KTU of “research-based studies of international level.” Recruitment, properly executed, could become the instrument for introducing breath into the Programme, raising the educational level and bringing research to the Department.

The closed circle of teachers (KTU graduates), students, alumni, local employers (also mainly KTU graduates) are very pleased with the Programme and its products. The whole activity is, however, introspective, with local industry staffed by alumni, who then recruit essentially the

entire output of the Programme. Although this works perfectly under the present conditions and fully satisfies a need, the Programme, as structured today will not be able to meet different future challenges in a rapidly changing world.

VI. GENERAL ASSESSMENT

The study programme *Thermal Engineering* (state code – 621E30001) at Kaunas University of Technology is given a positive evaluation.

Study programme assessment in points by evaluation areas.

No.	Evaluation Area	Evaluation of an area in points*
1.	Programme aims and learning outcomes	2
2.	Curriculum design	2
3.	Teaching staff	2
4.	Facilities and learning resources	3
5.	Study process and students' performance assessment	3
6.	Programme management	3
	Total:	15

*1 (unsatisfactory) - there are essential shortcomings that must be eliminated;
 2 (satisfactory) - meets the established minimum requirements, needs improvement;
 3 (good) - the field develops systematically, has distinctive features;
 4 (very good) - the field is exceptionally good.

Grupės vadovas: Review Panel leader:	Prof. George Yadigaroglu
Grupės nariai: Panel members:	Prof. Andres Siirde
	Dr. Simon Walker
	Dr. Rolandas Urbonas
	Ms Julija Baniukevič

**KAUNO TECHNOLOGIJOS UNIVERSITETO ANTROSIOS PAKOPOS STUDIJŲ
PROGRAMOS TERMOINŽINERIJA (VALSTYBINIS KODAS – 621E30001) 2016-01-29
EKSPERTINIO VERTINIMO IŠVADŲ
NR. SV4-46 IŠRAŠAS**

<...>

V. APIBENDRINAMASIS ĮVERTINIMAS

Kauno technologijos universiteto studijų programa *Termoinžinerija* (valstybinis kodas – 621E30001) vertinama **teigiamai**.

Eil. Nr.	Vertinimo sritis	Srities įvertinimas, balais*
1.	Programos tikslai ir numatomi studijų rezultatai	2
2.	Programos sandara	2
3.	Personalas	2
4.	Materialieji ištekliai	3
5.	Studijų eiga ir jos vertinimas	3
6.	Programos vadyba	3
	Iš viso:	15

* 1 - Nepatenkinamai (yra esminių trūkumų, kuriuos būtina pašalinti)

2 - Patenkinamai (tenkina minimalius reikalavimus, reikia tobulinti)

3 - Gerai (sistemiškai plėtojama sritis, turi savitų bruožų)

4 - Labai gerai (sritis yra išskirtinė)

<...>

IV. SANTRAUKA

Savianalizės suvestinė (toliau – SS) apima reikiamus aspektus ir yra išsami. Joje atispindi, kad akademinis personalas žino tam tikras programos silpnybes ir apribojimus bei bando rasti tinkamus sprendimus. Kita vertus, SS yra daugiau formalaus ir biurokratinio pobūdžio, parengta orientuojantis į atitiktį šalies teisės aktų reikalavimams, tuo pačiu joje yra pateikiamas ribotas programos kokybės, akademinio personalo ir studijų dalykų vertinimas.

Studijų programą vykdančios katedros struktūra ir veikimo principai yra panašūs kaip ir kitose Europos aukštojo mokslo institucijose, kurioms būdingas aukšto lygio specialistų rengimas. Formaliai studijų programa savo turiniu ir sandara taip pat yra panaši į kitų Europos universitetų.

Programa atitinka teisės aktų reikalavimus.

Ši studijų programa yra labai funkcionali, nes atitinka konkretaus vietas ir (arba) šalies pramonės sektoriaus poreikius (rajono šildymo, šildymo ir vėsinimo bei kitas susijusias sritis), vis dėlto tuo pat metu ji yra gana siaura. Nepanašu, kad programa skatintų studentus plėsti jų išsilavinimo apimtį, kaip tai turėtų užtikrinti universitetinės studijos. Studijų programos studentai yra Kauno technologijos universiteto pirmosios pakopos studijų programos absolventai. Šioje studijų programoje nestudijuoją nei vienas studentas iš kito universiteto.

Ekspertų grupė nusivylė sužinojusi, kad tik 1/3 dėstytojų atitinka kriterijus vadovauti doktorantams. Akivaizdu, kad dėstytojai gali dėstyti tam tikros apimties studijų dalykus, tačiau mokslo tiriamosios veiklos stoka apriboja aukščiau aptartą pasinaudojimą galimybe.

Nėra optimalu, kad 54 proc. dėstytojų yra vyresni nei 60 metų, o 85 proc. – virš 50 metų. Akademinis personalas yra itin homogeniškas, kadangi didžioji dauguma dėstytojų studijavo ir visą savo akademinięs karjeros laiką praleido Kauno technologijos universitete. Reikėtų aktyvesnės ir efektyvesnės priėmimo į darbą politikos, siekiant užtikrinti dėstytojų kvalifikacijos įvairovę bei garantuoti, kad studijų programoje būtų pasiekiami esami siauri uždaviniai bei tuo pat metu didinama programos aprėptis priimant ateities iššūkius. Ši studijų programa neatitinka Kauno technologijos universiteto misijos: „moksliniai tyrimais grįstos tarptautinio lygio studijos“. Tinkamai vykdomas akademinio personalo įdarbinimas galėtų prisdėti prie programos apimties didinimo, išsilavinimo lygio kėlimo ir mokslo tiriamosios veiklos katedroje aktyvinimo.

Labai uždaras dėstytojų ratas (Kauno technologijos universiteto absolventai), studentai, absolventai, vietas darbdaviai (taip pat dažniausiai Kauno technologijos universiteto absolventai) yra labai patenkinti šia studijų programa ir jos rengiamais specialistais. Vis dėlto, visa veikla yra itin introspekcinė, kuomet vietas pramonėje dirba tik programos absolventai, kurie atitinkamai samdo tik baigusiuosius šią studijų programą. Nors minėtoji sistema dabartinėmis sąlygomis ir veikia puikiai bei visiškai tenkina rinkos poreikius, ilgalaikėje perspektyvoje tai nepadės susidoroti su ateities iššūkiais greitai kintančiame pasaulyje.

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IV. IŠSKIRTINĖS KOKYBĖS PAVYZDŽIAI

Ekspertų grupė buvo sužavėta ypač glaudžiu pramonės ir programos vykdytojų bendradarbiavimu, kuris lemia bendrą visų socialinių dalininkų: dėstytojų, studentų, absolventų ir darbdavių pasitenkinimą (papildomos informacijos šiuo klausimu rasite *Ivadinėse bendrosiose pastabose*).

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III. REKOMENDACIJOS

Rekomendacijos yra teikiamos visose vertinimo išvadose, o šiame skyriuje jos yra pakartojamos:

1. Ekspertų grupė rekomenduoja peržiūrėti studijų programos tikslus ir numatomus studijų rezultatus, kad jie būtų konkretesni ir labiau susiję su studijų programa.
2. Ekspertų grupė rekomenduoja apsvarstyti alternatyvą specializacijos studijų dalykus rinktis iš bendro sąrašo, siekiant, kad studentai patys galėtų nusistatyti savo specializacijos sritį. Tai sukurtų prielaidas išvengti dalykų persidengimo ir leistų pagerinti dėstymą.
3. Ekspertų grupė norėtų priminti, kad vienas iš techninio rengimo ir plataus mokslinio išsilavinimo skirtumų yra tas, kad mokslinių išsilavinimą geriausiai suteikia akademikai, aktyviai dalyvaujantys moksliniuose tyrimuose, susijusiuose su dėstomu dalyku. Šiuo atveju ekspertų grupė rekomenduoja akademiniam personalui, dėstančiam antrosios pakopos studijų dalykus, žymiai aktyviau dalyvauti mokslo tiriamojoje veikloje. Reikėtų toliau stiprinti ryšius su kaimynystėje esančiu Lietuvos energetikos institutu.
4. Pageidautina, kad studentai aktyviau dalyvautų moksliniuose, išskaitant taikomuosius, tyrimuose. Aktyvesnis dėstytojų dalyvavimas mokslo tiriamojoje veikloje suteiktų daugiau įsitrukimo galimybių studentams.
5. Ekspertų grupė akademiniam personalui rekomenduoja daugiau vizitų į Europos aukštojo mokslo institucijas, daugiau kūrybinių atostogų užsienyje ir panašių veiklų, kurios apimtu daugiau nei paprastas dėstymo įgūdžių tobulinimas.
6. Skatinti studentus aktyviau naudotis galimybėmis dalyvauti studentų mainų programose.
7. Ekspertų grupė rekomenduoja atnaujinti dėstytojų kolektyvą ir priimti naujų jaunų dėstytojų, kurių domėjimosi laukas yra platus, išskaitant ir siekį įsitrukinti į mokslo tiriamą veiklą. Katedra susiduria su sunkumais sukuriant sąlygas ir pritraukiant tokius asmenis, ypatingai iš kitų aukštojo mokslo institucijų, turint tikslą išvengti tos pačios aukštostosios mokyklos dominavimo.
8. Ekspertų grupė rekomenduoja ieškoti būdų, kaip padidinti studentų dalyvavimą vertinant studijų dalykus. Taip pat rekomenduojama, kad dėstytojas pristatyti (anoniminio) vertinimo rezultatus studentams ir juos aptartų.

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Paslaugos teikėjas patvirtina, jog yra susipažinęs su Lietuvos Respublikos baudžiamojo kodekso 235 straipsnio, numatančio atsakomybę už melagingą ar žinomai neteisingai atliktą vertimą, reikalavimais.

Vertėjos rekvizitai (vardas, pavardė, parašas)