STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

# KAUNO TECHNOLOGIJOS UNIVERSITETO PRAMONĖS TERMOINŽINERIJOS PROGRAMOS (621E30002) VERTINIMO IŠVADOS

# EVALUATION REPORT OF INDUSTRIAL THERMAL ENGINEERING (621E30002) STUDY PROGRAMME AT KAUNAS UNIVERSITY OF TECHNOLOGY


Grupės vadovas:
Team Leader: Prof. Dr. Manfred Josef Hampe

Grupės nariai:
Team members: Prof. Dr. Zbigniew Hanzelka

Dr. Rolandas Urbonas

Šarūnas Venslavas


Išvados parengtos anglų kalba
Report language - English


Vilnius
2012

## DUOMENYS APIE ĮVERTINTĄ PROGRAMĄ

| | |
|---|---|
| Studijų programos pavadinimas | Pramonės termoinžinerija |
| Valstybinis kodas | 621E30002 |
| Studijų sritis | Technologijos mokslų studijų sritis |
| Studijų kryptis | Energijos inžinerija |
| Studijų programos rūšis | Universitetinė |
| Studijų pakopa | antroji |
| Studijų forma (trukmė metais) | Nuolatinė (1,5) |
| Studijų programos apimtis kreditais[1] | 60 |
| Suteikiamas laipsnis ir (ar) profesinė kvalifikacija | Energijos inžinerijos magistras |
| Studijų programos įregistravimo data | **2007 02 19** |

[1] – vienas kreditas laikomas lygiu 40 studento darbo valandų

## INFORMATION ON ASSESSED STUDY PROGRAMME

| | |
|---|---|
| Name of the study programme | ***Industrial Thermal Engineering*** |
| State code | 621E30002 |
| Study area | |
| Study field | Energy engineering |
| Kind of the study programme | University studies |
| Level of studies | second |
| Study mode (length in years) | Full-time (1.5) |
| Scope of the study programme in national credits | 60 |
| Degree and (or) professional qualifications awarded | Master of Power Engineering |
| Date of registration of the study programme | February 19 2007 |

# CONTENTS

## I. INTRODUCTION

The assessment is based on the analysis of documents prepared by the self-assessment group of experts from the KAUNAS UNIVERSITY OF TECHNOLOGY and the information obtained from the representatives of the assessed institution during the visit of the assessment team at the university on 2012-03-28.

The basis for the assessment were requirements set forth in:

1. METHODOLOGY FOR EVALUATION OF HIGHER EDUCATION STUDY PROGRAMS (Approved by Order No 1-01-162 of 20 December 2010 of the Director of the Centre for Quality Assessment in Higher Education)
2. EXTRACTS FROM THE DESCRIPTION OF THE EVALUATION PROCESS FOR STUDY PROGRAMMES AND METHODOLOGICAL GUIDELINES
3. Financing system of higher education Institutions (HEI) in Lithuania
4. HIGHER EDUCATION SYSTEM IN LITHUANIA – SHORT INTRODUCTION
5. A Framework for Qualifications of The European Higher Education Area, http://www.bologna-bergen2005.no/Docs/00-Main_doc/050218_QF_EHEA.pdf
6. A Tuning Guide to Formulating Degree Programme Profiles Including Programme Competences and Programme Learning Outcomes, http://core-project.eu/documents/Tuning%20G%20Formulating%20Degree%20PR4.pdf

Schedule for the visit:

The members of the audit team have acquainted themselves with and provisionally assessed the documentation and annexes provided by the Centre. The following schedule for the visit has been prepared and executed:

Table 1.

| **Wednesday, 28 March** | |
|---|---|
| | |
| 09.00 – 10.00 | Meeting faculty administration |
| 10.00 – 11.00 | Meeting self-evaluation team |
| 11.00 – 11.10 | *Short break* |
| 11.10 – 12.00 | Meeting teaching staff |
| 12.00 – 13.00 | *Lunch* |
| 13.00 – 13.45 | Visiting auditoriums, libraries, other facilities |
| 13.45 – 14.30 | Review of students‘ course and final papers, examination tasks, other material requested by expert team |
| 14.30– 15.05 | Meeting students |
| 15.05– 15.40 | Meeting graduates |
| 15.40 – 16.15 | Meeting employers |
| 16.15 – 16.45 | Team meeting, preparation of presentation of preliminary findings |
| 16.45 – 17.05 | Presentation of preliminary findings to University community |

## II. PROGRAMME ANALYSIS

Three second cycle degree programs in the study field of Energy Engineering (in SER – Power Engineering) are offered at the Faculty of Mechanical Engineering and Mechatronics of Kaunas University of Technology:

- Thermal Engineering (duration 2 years)
- Nuclear Energy (duration 2 years) and
- the programme covered here: *Industrial Thermal Engineering* (duration 1.5 years). In Kaunas University of Technology the English description of the programme the title is "Industrial Heat Engineering". http://uais.cr.ktu.lt/plsql/mod_dest/stp_report_ects.card_ml?p_valkod=621E30002&p_year=2012&p_lang=EN The degree programme comprises mandatory courses and electives from the own field as well as electives from the adjacent fields Thermal Power Engineering, Refrigeration Engineering and Food Industry Engineering. The programme is in full time study mode. Graduates from the programme are conferred the academic degree "Master of Power Engineering" (according to http://uais.cr.ktu.lt/plsql/mod_dest/stp_report_ects.card_ml?p_valkod=621E30002&p_year=2012&p_lang=EN – Master of Energy Engineering).

### *1. Programme aims and learning outcomes*

The university defined:

- as the purpose of the Master's study programme (second cycle): "to deepen student's competence gained during the first level (undergraduate studies) study programme" which is in compliance with the Order of the Minister of Education and Science of the Republic of Lithuania
- as the main aims of study programme: "to provide deep theoretical knowledge of energy engineering, to aid in acquiring major scientific research methods used in industrial thermal engineering, to develop abilities for preparation and implementation of engineering solutions while evaluating their interrelations with other participants of industrial processes and the environment. Industrial Thermal Engineering second cycle studies assure possibilities for continuation of studying in energy and thermal engineering field Doctoral studies".
- 16 key learning outcomes of the study programme: The key learning outcomes are divided into four groups:
    1. Knowledge and understanding
    2. Intellectual abilities
    3. Practical abilities and skills
    4. General transferable abilities and skills

  In order to link the key learning outcomes and the study modules included in a programme a special matrix (link matrix) is used at the University.

The learning outcomes of the degree programme as presented in the self evaluation report do not completely and accurately describe the actually intended outcomes. Nor does the English name of the degree programme correctly represent the very essence of the programme. Industrial engineering deals with utilizing and coordinating humans, machines and materials. This is not what the degree programme Industrial Thermal Engineering is about. Instead, the programme focusses on the application of thermal engineering in the process industries. While the other two programmes (Thermal Engineering and Nuclear Energy) seem to be research oriented, the programme considered here is an application oriented thermal engineering programme. The name of the programme should be converted from "Industrial Thermal Engineering" to a name

that better characterises the essence of the programme. It is the responsibility of the university to find an appropriate name for the degree programme. When discussing this subject with the faculty the name "Applied Thermal Engineering" as an appropriate name for the degree programme emerged. The assessment team would not oppose to such a name.

The assessment team could conclude that learning outcomes compatible with the QF-EHEA are implicitly present, although they are not explicitly stated. Thus, the learning outcomes should be refined according to European standards (A Tuning Guide to Formulating Degree Programme Profiles Including Programme Competences and Programme Learning Outcomes, http://core-project.eu/documents/Tuning%20G%20Formulating%20Degree%20PR4.pdf ).

From the discussion with the graduates of the programme and the employers of the graduates, the assessment team concluded that the aims and the learning outcomes of the programme meet the needs of the Lithuanian industry and needs of the European labour market.

Aims and learning outcomes of Industrial Thermal Engineering second cycle studies and other information related with study programme are freely accessible in web site of Kaunas University of Technology - in Lithuanian. However, the information given in English is very limited. Although the programme is completely taught in Lithuanian, the assessment team recommends presenting the same and full information in both languages on the web.

**Strengths**

The orientation of the degree programme towards application can be seen as a major strength. Students do not necessarily need to be educated as researchers, by offering both application oriented and research oriented study programmes the university takes into account the diverse abilities of students and meets the needs of the domestic and the European labour market for diversely trained and educated engineers.

**Weaknesses** A weakness of the programme is the incompletely and insufficiently written learning outcomes of the programme. In particular, the different learning outcomes of the two master programmes "Thermal Engineering" and "Industrial Thermal Engineering" must be clearly defined, taking into account the different duration, aims and objectives of the two programmes (4 and 3 semesters, respectively). Arguments presented by faculty administration and teaching staff that the "Thermal Engineering" programme is more research oriented compared to the more application oriented "Industrial Thermal Engineering" programme imply that these students acquire practical abilities during an industrial placement before and/or during the second level study.

While the faculty points out that practical abilities and experience are prerequisites for admission to the programme, the admission rules to the second level studies do not require other qualifications but the first cycle degree.

## *2. Curriculum design*

Lithuanian legal requirements for second level study program are fulfilled, i.e.:

1. The considered program comprises 90 ECTS credits (should be not less than 90 and not more than 120), its duration is one and a half years divided into two autumn and one spring semester. In each semester the students have to earn 25-30 ECTS credits. For specialization in the fields of Thermal Power Engineering, Refrigeration Engineering and Food Industrial Engineering 24 ECTS credits are allocated in the 1$^{st}$ and 2$^{nd}$ semesters with 12 ECTS credits

in each of them. Depending on their interests students can choose one 6 ECTS credited subject from 4 alternatively proposed subjects.
2. Main subjects amount to 72 study credits and, thus, comply with the requirement minimum of no less than 60 study credits.
3. Elective subjects (intended for preparation for doctoral studies (research work) as well as general subjects of university studies and freely chosen subjects (alternatives) required for the achievement of study programme aims amount to 18 study credits, and thus, complies with the requirement maximum of no more than 30 study credits.
4. The requirement of not exceeding 5 modules during one semester is implemented in all semesters.
5. Individual studies of the students amount to 50-60 % of the volume of each study subject, and, thus, comply with the required minimum of no less than 30 %.
6. For the preparation and defence of the Final Degree Project 30 study credits are allocated, i.e. no less than required 30 ECTS credits.
7. The final degree project is defended at a public meeting of the committee approved by the Rector‘s order. The committee consists of scientists from the study field and representatives of employers. The chairman of the committee is not an academic teacher from the university but rather a representative from the industry.

The educational components appear not to be consistently designed. Some courses, e. g. Thermodynamics, Thermal Kinetics, and Heat Transformation seem to be identical with courses from other, more research oriented graduate programmes. If the Industrial Thermal Engineering programme is application oriented, application oriented courses were to be expected. Despite the inconsistency that research oriented courses are taught in an application oriented programme or vice versa, the study subjects cover important areas of energy engineering; themes do not repeat.

A graduate programme cannot cover all possible themes of a study field. It will concentrate on important aspects and cover special topics exemplarily. The students need to prepare themselves for lifelong learning.

In general, the scope of the programme ensures the intended learning outcomes. Because of the research activities of the academic teachers and the participation of the graduate students in research projects the university ensures that some of the latest achievements in science and technology penetrate into the education of the students.
Nevertheless, the curriculum is rather traditional and not very innovative. Modern subjects like the distributed generation of energy or the design of passive building seem not to be covered.

The content of each educational component corresponds to the intended learning outcomes of that component. However, in the opinion of the assessment team the learning outcomes should be revisited by using an internationally accepted taxonomy (e.g. the taxonomy of Bloom). Currently (at least in English version of the modules’ description) knowledge and understanding are the basic learning outcomes, while for a second cycle study programme application of the acquired knowledge, analysis and synthesis should be indicated as well.

The number of ECTS credits per educational component has been carefully assigned in each case. However, consistency is lacking: e.g.in the two courses Labour Law and Engineering Economics the course descriptions quote 4 credits, but the Table 2.3 (SER) provides 6 credits). The size of an educational component varies according to the workload for the average student. The calculation of the student workload and the assignment of ECTS credits comply with the ECTS rules.

The content of an educational component is in each case thematically defined. Taking into account student exchange with foreign countries, both size and content of all of them seem to be appropriate. The educational components are neither too big to prevent transfer of credits and marks for mobile students, nor are they too small, which would lead to an inappropriate high number of exams.

For the purposes of the programme the knowledge is transferred in various rather traditional forms. The assessment team does not find evidence that activating forms of learning and teaching are practiced. The present programme does not prepare the students sufficiently to cooperate in industrial teams. A way of engaging students to participate actively in the process of learning is to introduce project-based learning (PBL). Here, the students get ownership over the process of learning; they themselves determine the pace and the subject of learning. Moreover, the students are able to acquire general skills like the ability to cooperate in teams, to communicate and to present. The assessment team recommends starting with problem-based learning in one or two subjects at first. Because the teaching of PBL courses requires special knowledge in didactic methods, the assessment team recommends sending professors and staff to other (foreign) universities, where PBL is applied in order to learn about best practice in this field.

Since the degree program Industrial Thermal Engineering can be accessed with rather diverse pre-knowledge from a variety of undergraduate programmes it is necessary that the prerequisites for all educational units of the degree programme are very clearly stated. This is not the case with all descriptions of the educational units. All descriptions of the educational units must contain the list of relevant and recommended textbooks of the subject. A sufficient number of these textbooks must be available in the university library.

Specialised literature can be made accessible to students participating in the course in the form of pdf documents or scanned files without infringing intellectual property rights if a learning platform is used and only participants of the course are granted access. The assessment team did not find evidence that a learning platform is actually used in this degree programme. Some of the learning platforms are available in the public domain (e.g. Moodle) and do not lead to additional costs for the university.
On inspecting some of the master theses the assessment team observed that quite often scanned pictures from other sources had been deliberately incorporated into the theses without proper citation. Thus, the key learning outcome D5 (use normative documentation) seems not to be addressed sufficiently.

During the interviews with the students, the staff, and the representatives from the industry, the assessment team perceived that the majority of the students work at least part time in the industry in order to finance their living. Moreover, the master's thesis is generally conducted in the industry and not in the university.

While a close interaction between the university and the industry is essential for an applied degree programme, nevertheless the primacy of the university education is important. E. g. if a theme for a master's theses is given to a student the university has to ensure that original research is done by the student. The assessment team concluded from the remarks of the students and the representatives from the industry as well as from the written theses, that this is not always the case but that quite often ordinary, routine engineering tasks were given to the students as the theme for the master's thesis. It is not the purpose of university studies to perform work in the industry that equally well could be done by employed engineers.

**Strengths**

The study subjects are arranged consistently and cover essential areas of energy engineering. The content of the programme conforms to the current state of knowledge in the considered discipline. The close connection to the industry is a particular strength of the programme

**Weaknesses**

A weakness of the programme is the traditional type of instruction. The professors are not aware or do not practise modern forms of instruction like problem-based learning or other activating forms of learning and teaching.
Another weakness of the programme is that the interaction between the university and the industry is not well defined. The supremacy of the university in all educational decisions must be ensured. The responsibility for marking the master's theses must be with the university. If an industrial placement is considered to be indispensable for an application oriented study programme it should be defined as an educational component or as a requirement for accessing the degree programme.

## *3. Staff*

The teaching staff in this programme consists of 13 professors, associated professors and academic lecturers holding doctoral degrees. The qualification of the teaching staff complies with the legal requirements and is adequate to ensure the proper conduct of the programme.

All lecturers of study subjects hold a scientific degree. Thus, the minimum requirement of 80 % holding a scientific degree is fulfilled. The field of scientific activity of all lecturers corresponds to the subjects taught, thus meeting the requirement that no less than 60% must be scientifically active in the taught areas. 45% of the main subjects are taught by professors, thus exceeding the minimum requirement of 20 %.

The assessment team concludes from the publication list of the academic teachers that the faculty is active in research that is directly related to the study programme.

The number of first year students was 12 in 2006. The number dropped to 6 in 2011/12. According to these figures the current ratio of students to academic teachers is less than 0.5. The assessment team has gained the impression that the capacity of the university for student intake into this degree programme is not yet at its limit.

SER has indicated a low international mobility of the staff (see e.g. information included in SER table 2.6 for 2006-2010). Low international staff mobility seems to be a general problem of the faculty as a whole, not just of the assessed programme.
The assessment team recommends to take action and to participate in the European mobility programmes for academics in order to increase the mobility of the staff. Upon questioning the teaching staff on possibilities of professional advancement of their didactic skills, the assessment team won the impression that there exists some potential for improvement. For instance, professors should have the opportunity to spend a sabbatical at a university abroad in order to exchange ideas on modern didactic methods as well as on research. The didactic abilities of the academic teachers need constant refurbishing and improvement. If a didactic centre were available either at the university or centrally at Lithuania, the academic teachers should be sent there regularly for refreshing their didactic skills and to learn about new didactic principles. A valuable source of information that obviously is not yet used by the university and their academic teachers are the annual conferences of organizations dealing with engineering education, e.g. SEFI (European Society for Engineering Education) and ASEE (American

Society for Engineering Education). According to the rules of Qualification Development, lecturers and researchers must improve their qualification at least once in five years mainly at foreign institutions. However, this condition was not always fulfilled e.g. the skills were improved at KTU with an unknown number of weeks.

The teacher workload varies between 132 and 1375 h/year. While the lower limit is really low compared to international standard, the upper limit seems to be rather high. However, given the ratio of students to teaching staff, the assessment team does not think the teacher workload to exceed acceptable limits. There are no courses conducted by experienced specialists from the industry. A degree programme emphasising application orientation would benefit from electives taught by practitioners.

Many academic teachers are active in academic research directly related to the study programme being reviewed. The staff's papers are published mainly in local periodicals and proceedings of national conferences.

**Strength**
The **s**tudy programme Industrial Thermal Engineering is taught by scientifically highly qualified teaching staff.

**Weakness**
There is a lack of new didactic methods and a lack of opportunities for the self-improvement. The instrument of a sabbatical leave seems not to be widely known.

### *4. Facilities and learning resources*

Lectures and laboratory training of the Industrial Thermal Engineering programme are conducted in the premises of the Faculty of Mechanical Engineering and Mechatronics. The building visited by assessment team is in good shape. Sanitary installations in the building are clean, and functioning. A sufficient number of lecture halls and student classrooms are available. They are equipped with the necessary furniture and basic didactic material. Projectors and computers for multimedia based instruction are available. Very modern didactic equipment like digital whiteboards or smart boards is yet missing.

Whenever necessary and required the educational components provide for adequate practical training of the students in the laboratories of the university.

The University facilities (laboratories, lecture rooms, etc.) are not are not sufficiently adjusted for the needs of disabled students.

All students reported upon questioning to have access to the university servers from their private computers. Wireless connection to Internet (Wi-Fi) is available at the University. The assessment team was able to connect their laptop computers to the internet using EDUROAM.

The equipment in the laboratories visited by the assessment team was in general in acceptable condition. Austerity requires continuing to use old but still functioning equipment. As long as the didactic objectives are met nobody can possibly object. Some equipment (e,g, the solar energy or the biogas facilities) was very new and state of the art. Programme students use as well laboratories in other buildings as well as in the Lithuanian Energy Institute.

The assessment team critically observed several violations of safety requirements during the visit. E.g. students did not wear safety goggles and lab coats in a chemical laboratory. Gas cylinders were not housed in vented cabinets; they stood or lay loosely on the floor and were not

even secured by chains. Flasks with chemicals were not properly labelled. Laboratories were not properly equipped with at least two exits. At the doors of the laboratories signposts indicating what personal protection to wear, were missing. The safety standards in the laboratories are not acceptable at all. Immediate action in order to meet minimum safety standards needs to be taken by the university.

The assessment team gained the impression that the university uses its resources efficiently. However, the resources are limited and need to be enhanced in order to become more competitive on a European level.

The assessment team visited the university library. Conventional access to literature, i.e. walking to the library, lending printed books or journals, or ordering missing literature from other university libraries, is possible and practised. The library is equipped with a sufficient number of computer work places with internet access. The university has bought online access to some of the journals (e.g. IEEE Xplore, SciVerse), books and textbooks of leading publishers. However, some of the often required literature is not available online, particularly limited is the number of e-books. Lecturers and students can access the electronic library catalogue from computers in their office rooms or in the reading rooms of the library (http://biblioteka.ktu.edu).

**Strengths**
The physical condition of the premises used for studies is rather good and complies with hygiene requirements. The internet is easily accessible via WLAN. Access to online literature is possible in principle.

**Weaknesses**
Violations of the safety requirements in the student laboratories are not acceptable. Another weakness is the insufficient infrastructure to accommodate disabled students. Although access to online literature is possible in principle, the scope of the accessible literature is rather limited.

## *5. Study process and student assessment*

Admission to the second cycle study programme Industrial Thermal Engineering, according Admission rules of KTU to the second cycle studies, is carried out on the basis of competition: Applicants are ranked according the competition score, which is composed from mean weighted value of the grades of first cycle study programme and the evaluation grade of research activities (publications, conference programs, competition documents and other). The number of candidates exceeds the amount of students according to the average relation 1.5:1. The ranked order of the applicants is announced in advance on the faculty's announcement board and on its web page. The possibility of appeal is foreseen. The detailed information about the programme and the rules of admission is available at the University web site and in the annually printed publication "KTU study programs". To the assessment team the admission to master studies appears to be equal and fair for all applicants.

The absolute number of participants in the degree programme is small. The participation of students is insufficient in the long run. The programme will not be sustainable if admission and graduation do not increase.

Entrants into this Programme are admitted either into fully state-subsidized places or into non-subsidized places where students have to pay full tuition fee for their education. Admission to the state-subsidized places is based on academic merits. The Senate of the University decides each year on the tuition fee for the study places. These depend on the number of educational components chosen. Rights and obligations of students from both state funded and non-

subsidized places are the same with the exception of the right to obtain a scholarship. The student's opinion on this aspect is positive. Currently none of the students pays tuition fees.

The students appear to be organized in social networks. The social support offered by the university to their students seems to be adequate.

The organisation of the study process ensures an adequate provision of the programme and the achievement of the learning outcomes. The students ascertained during their conversation with the assessment team that their teachers inform them at the beginning of each educational unit on the intended learning outcomes of the course.

The criteria for the evaluation of the student's achievements are publically announced at the beginning of a semester – at the first lecture of a study module the lecturer introduces the students with study module's aim, themes, tasks and schedule of self-education and the influence of their grade to the final grade.

Students' knowledge and skills are checked coherently during each semester. There are laboratory work, course papers and projects scheduled, and these assignments are constantly checked during the semester, often by knowledge tests. The final assessment of subject acquisition is mainly by a written exam. The students' opinion about the knowledge assessment is positive.

Students have opportunity to do research within the frame of the Research project and/or Final Degree Project. Other forms of student research were not found. The results of the students' research are presented during seminars and in the papers published in the proceedings of student conferences. Students who participated in the meeting with the assessment team were familiar with the conference for young scientists „Mechanical Engineering", which is organized in the Faculty of Mechanical Engineering and Mechatronics.

The assessment team has noticed that the students of Industrial Thermal Engineering are not internationally mobile. During the period under assessment only one student from the second cycle studies took part in student exchange. None of the students who took part in the meeting with the assessment team had undertaken any study abroad activities. Table 2.7 of the SER provides information on the student exchange not only of the assessed programme but rather for the whole faculty. Obviously, there are no incoming students.

Student mobility in this study programme can and should be improved. Student exchange can be individual ("free movers") or institutionalised between partner universities. The latter requires partnering with other universities. Based on information at KTU web site http://en.ktu.lt/content/international/cooperation-agreements, there is a sufficient number of Erasmus and bilateral agreements with foreign universities. In order that these partnerships are sustainable, it is important that equal partners form partnerships. The assessment team recommends to the university to form such institutional partnerships and send both students and academic teachers abroad.

Students expressed very positive opinion on the dean's office and the faculty authorities that are attentive to the students' everyday problems and helpful in solving them. They do not have any reservations regarding the organisation of the examination period (setting the exam dates). From the interview with the students the assessment team concluded that most of the students need to work in order to earn at least part of their living. Nevertheless, the degree programme is organized in such a way that both the educational and the personal needs are met. This is a proof of good cooperation of students and faculty administration.

The opinion about how internships are carried out was positive. Students perceive the teaching staff positively; the lecturers are available for the students during office-hours.

The students claimed that their decision to prefer the three semester application oriented programme to the four semester research oriented programme is due to the lower cost of the shorter programme. The majority of the graduates of the study programme find employment in the field of their education at the university, thus meeting the expectations of the programme provider.

The students asked about their preparation for graduate studies answered that their preparation for graduate studies in the undergraduate education was adequate. All present students admitted that they are satisfied with their choice of both the University and the field of study. There were no major reservations concerning the study programme, only the need for a larger number of practical classes has been pointed out. Opportunities for finding employment in the studied profession have been described as good. It was also noted that some of the lecturers provided lecture notes after the lectures.

**Strengths**
A strength of the programme is the clear and well-designed curriculum. Students are able to complete the programme without delay and within the standard period of studies. The students are happy with the degree programme and the employers are happy with both the graduates and the level of knowledge acquired by the graduates.

**Weaknesses**
A weakness of the degree programme is the low number of students within the programme. Another weakness is the low international mobility of students and staff.

### *6. Programme management*

The university has created a system of quality assurance. The procedures for monitoring and revising the educational components of the programme as well as institutional and personal responsibilities are clearly defined. There are tools to continuously monitor the study quality; information received in this way is collected and is the base for making decisions.
The students regularly assess the educational components at the end of a semester. The dean's office collects and evaluates the results.

The analysis of the data on the numbers of admitted students and graduates during 2006 – 2010 reveals a drop of 13%. Also, the number of admitted students dropped from 14 to 6. Although it is not clear why these figures dropped, it is obvious that the capacity of the university is not used effectively. The faculty administration should analyse the reasons of this situation and should be more active in the promotion of the programme.

In the meeting with the employers an unexpectedly high number of industrial leaders took part. More than 25 representatives from the industry participated in the meeting, thus demonstrating the high priority that the industry assigns to the programme.

The employers and graduates have the opportunity to express their opinions related to the quality assessment and improvement of the programme, but not using a systematically approach, rather by informal contact with the university.

The employers emphasized the good theoretical preparation of the graduates for professional work, whereas their practical knowledge was assessed as sometimes insufficient. A part of participants in the discussion regarded this as a weakness of the study programme that should be

eliminated. Facility of finding the job is, according to their opinion, the best proof that such a competition on the labour market is needed.

Two employers participating in the meeting with the assessment team appreciated the additional knowledge achieved by students within the master study programme compared to the first cycle graduates. Others do not differentiate between employees with bachelor's or master's degrees.

**Strengths**
The university has established a continuous improvement process for the degree programme. The opinions of the stakeholders influence the design and conductance of the degree programme

**Weaknesses**
The continuous decrease of the number of students is a weakness of the programme

## III. RECOMMENDATIONS

In 2007 an external evaluation of Industrial Thermal Engineering study programme was performed. This study programme received conditional approval. In the final conclusion the experts stipulated:

1. That the theoretical basis of study programme is weak and does not prepare the graduates to participate in doctoral studies.
2. That the industry would not clearly recognise the difference between the more research oriented and the more application oriented graduate programmes and that the degrees awarded in both programmes should differ.
3. That the laboratories were sub-standard and not equipped with state-of-the-art apparatus and machinery.
4. That the access to methodological literature should be improved and that the students should participate more deeply in research activities
5. That the degrees of the more application oriented programme and the more research oriented programme should differ from one another.

In an effort to overhaul the degree programme the university made some corrections to the programme, so that some of the shortcomings have been overcome in the present programme.

The assessment team combines their findings on the previous recommendations and their present recommendations below:

3.1.
The equipment of the laboratories has been modernised. However, occupational health and safety in the laboratories is in very poor and not acceptable condition. Measures to be taken should in detail and immediately be elaborated by the faculty in cooperation with the chief safety officer of the university. The university must provide for the necessary investment.
3.2.
The existence of two master programmes in the same engineering field, with different learning outcomes and different lengths of the programmes confuses employers and prospective students. However, the employers will be able to extract detailed information on both types of programmes from the diploma supplements issued by the university together with the certificates and diplomas. Prospective students are supposed to inform themselves about the degree programmes. The university does provide sufficient information. The academic degree conferred after graduation is the same in the more application oriented programme and in the more research oriented programme. The international members of the assessment team learned from the Lithuanian members that Lithuanians expect different academic degrees for different academic programmes. In some other countries it is custom not to have specialised degrees and

to confer the same degree (e. g. Master of Science) to graduates of different degree programmes. In any case, transparency is of utmost importance. If it is Lithuanian custom to award different academic degrees to different study programmes, the custom should be followed.

The application orientation of the assessed study program (opinion presented by faculty administration) and the shorter time to graduation and in consequence the lower study costs (opinion presented by the students, graduates and employers) cannot be valid arguments for the programme to exist. When asking the stakeholders for their advice it should be kept in mind that stakeholders hardly argue altruistically and that their advice might be biased. The university has to consider carefully if it really makes sense to offer a short application oriented graduate programme and a long research oriented programme in Power Engineering for two small cohorts of students simultaneously.

3.3.

The faculty should consider incorporating elements of problem based learning into the degree programme. In order to do so, the assessment team recommends external counselling. Such courses can be organised in cooperation with the industry, thus enhancing the practical skills of the students and simultaneously intensifying the cooperation with the industry.

3.4.

Lacking international mobility was a point of concern in the last assessment in 2007. Not much has changed in the meantime. The university should put more effort to increase the international mobility of students and staff. The university and the faculty should look for equal partners for student and teacher exchange.

3.5.

The assessment team recommends to constantly refurbish the content of the degree programme and to adapt it to contemporary needs.

3.7.

If the university decides to continue with the more application oriented degree programme Industrial Power Engineering, pro-active action should be taken in order to increase the number of students.

3.8.

The English title of the programme should be revised in order to be consistent with similar content programmes outside the Lithuania.

3.9.

The aims and the objectives as well as the learning outcomes of the degree programme as a whole and its educational components should be revised .in order to become compliant with international standard.

## IV. SUMMARY

The degree programme “Industrial Thermal Engineering” is an application oriented graduate programme. The English name of the programme does not express what the essence of the programme is and should be reconsidered. Graduates are trained as engineers in order to be employed by the industry for highly qualified routine work. This can be considered as the main strength of the programme. However, the design of the degree programme is a very traditional one with a rather traditional scope and rather traditional methods of learning and teaching. This is a strength on the one hand because no basic subjects are missing, and a weakness on the other hand because activating forms of teaching and learning are not practiced and prospective technology is not covered. The assessment team recommends developing activating forms of learning and teaching.

Another drawback is the low number of students in the programme. If this number does not increase substantially the programme will not be sustainable.

The laboratories are equipped with sufficient and functioning experimental test rigs. However, occupational safety and health standards are not met. This is a structural problem that has to be solved immediately by the university.

IV. GENERAL ASSESSMENT

The study programme ***Industrial Thermal Engineering*** (state code – 621E30002) is given **positive** evaluation.

*Study programme assessment in points by fields of assessment*.

| No. | Evaluation Area | Evaluation Area in Points* |
|---|---|---|
| 1. | Programme aims and learning outcomes | **2** |
| 2. | Curriculum design | **2** |
| 3. | Staff | **3** |
| 4. | Material resources | **2** |
| 5. | Study process and assessment (student admission, study process student support, achievement assessment) | **3** |
| 6. | Programme management (programme administration, internal quality assurance) | **2** |
| | **Total:** | **14** |

*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:<br>Team Leader: | Prof. Dr. Manfred Josef Hampe |
| Grupės nariai:<br>Team members: | Prof. Dr. Zbigniew Hanzelka<br>Dr. Rolandas Urbonas<br>Šarūnas Venslavas |