STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

Kauno technologijos universiteto

PRAMONĖS INŽINERIJA IR VADYBA PROGRAMOS (621H77003)

VERTINIMO IŠVADOS

EVALUATION REPORT

OF *INDUSTRIAL ENGINEERING AND MANAGMENT* (621H77003)

STUDY PROGRAMME

at Kaunas University of Technology

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Išvados parengtos anglų kalba
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DUOMENYS APIE ĮVERTINTĄ PROGRAMĄ

Studijų programos pavadinimas	***Pramonės inžinerija ir vadyba***
Valstybinis kodas	621H77003
Studijų sritis	technologijos mokslai
Studijų kryptis	gamybos inžinerija
Studijų programos rūšis	universitetinės
Studijų pakopa	antroji
Studijų forma (trukmė metais)	nuolatinė (2)
Studijų programos apimtis kreditais	120
Suteikiamas laipsnis ir (ar) profesinė kvalifikacija	Pramonės inžinerijos magistras
Studijų programos įregistravimo data	2007-02-19, ISAK-225

INFORMATION ON ASSESSED STUDY PROGRAMME

Name of the study programme	***Industrial Engineering and Management***
State code	621H77003
Study area	technological sciences
Study field	production and manufacturing engineering
Kind of the study programme	university studies
Level of studies	second
Study mode (length in years)	full-time (2)
Scope of the study programme in credits	120
Degree and (or) professional qualifications awarded	Master of Industrial Engineering
Date of registration of the study programme	19-02-2007, ISAK-225

CONTENTS

I. INTRODUCTION

Three Lithuanian universities offer programmes in the study field of Industrial Engineering: Kaunas University of Technology (*KTU*), Klaipeda's university (*KU*) and Vilnius Gediminas Technical University (*VGTU*). Subject units of similar content compile about 65 % of these programmes. This aspect facilitate for students to migrate. The university or study programme is mostly chosen according to the territorial factor.

In KTU, the second cycle study programme *Industrial Engineering and Management* (further *IEM*) is operated by the Faculty of Mechanical Engineering and Mechatronics. The IEM programme features engineering and management subjects aimed to provide knowledge of manufacturing technologies, abilities to design and manage production processes. The programme provides full time studies in English.

The programme belongs to the area of Technological sciences and the study field of Industrial Engineering and is registered in the register of study and educational programmes by the Order No. 56 of 23 April 1994 of the Minister of Education and Science of Lithuanian Republic. It was registered in the Register of study and education programs in 2007-02-19. The state code is 621H77003.

The graduates of the programme acquire the qualification of master of industrial engineering.

II. PROGRAMME ANALYSIS

1. Programme aims and learning outcomes

The programme addresses an identified need from national industry, somewhat complicated by the needs to both raise Lithuanian industry's position in the value chain (need for "specialists" with advanced knowledge in particular technologies) and to cater for the "generalist" competence needs of SME's where a breadth of knowledge and skills is required. As will be discussed later, breadth of knowledge and skills rather than specialisation is the stronger characteristic of the curriculum.

The name of the programme is consistent with its aim and learning outcomes. The aims and outcomes are publicly available.

The programme learning outcomes are derived from the EUR-ACE requirements for 2nd cycle degrees and thus established to international standards. The learning outcomes have been contextualized to the industrial engineering and management context. However, the contextualization is modest. It is achieved by editing the specific topics of the EUR-ACE syllabus to the IEM context, typically by inserting "production", "innovation" or "industrial engineering" in the EUR-ACE outcomes, but the learning outcomes are not detailed further. This could have been done for, for example, the Knowledge and Understanding learning outcomes enabling a more precise definition of these outcomes, and thus a clearer description of what students know upon graduation. The high level of granulation of the learning outcomes results in a many-to-many mapping between outcomes and subjects, as discussed in section 2. The learning outcomes are further so general that the programme may be changed significantly without changes to the stated learning outcomes.

There are good routines in place to annually update the learning outcomes, with respect to input from faculty, students and employers.

In conclusion, the programme aims are relevant, well defined and regularly updated. However, the relatively high granularity of the learning outcomes lead to some issues with the mapping from the programme learning outcomes to the subjects, as will be discussed in the next section.

2. Curriculum design

The curriculum of the IEM programme comprises 120 ECTS in total, subdivided into 90 ECTS subjects and a final degree project of 30 ECTS. The subject block consists of 15 subjects, all of 6 ECTS. All subjects are compulsory; there are no elective subjects. This meets the basic legal requirements.

The subjects of the program address topics relevant to the field of Industrial engineering. There is an emphasis on production management subjects (circa 42 ECTS depending on classification) along with some more general management subjects and 12 ECTS project subjects. The subjects are spread out evenly will little repetition. However, the breadth of the curriculum also leads to that there is also relatively little in the curriculum that builds on earlier subjects. The subjects represent modern industrial practice in the area, but it seems that few subjects reflect recent research achievements. The programme is challenged by a tension between developing knowledge and skills closely aligned with Lithuanian industry needs and the national and international expectations of a master degree.

An interesting feature of the programme is the two research project subjects. This allows for some choice for the students. However, the two project subjects seem similar in their design. For example, they both focus on individual work. One avenue for developing the programme could be to change one of the project subjects into a large team-based project, enabling the development of skills of working in a large team and also leadership skills. This project subject could have a specific focus, e.g. an innovation project, whereas the other could maintain its research focus.

The general, yet complex, design of the programme learning outcomes results in a link to subjects that is very complex (table 2.3). It could be claimed that this table demonstrates that all intended learning outcomes are met. However, it is difficult to figure out how the up to 15 subjects/projects that are claimed to realize a particular learning outcome contribute, or how the subjects build on each other. Our impression is that the curriculum has not been designed to meet the EUR-ACE based learning outcomes but rather that this mapping was created in retrospect.

The average number of contact hours in a subject is 10.6. This is an adequate number for 2nd cycle education.

A review of selected final degree projects revealed some issues. The reports were relevant to the field but rather short, had few scientific paper references and lacked depth in the treatment of the subject. They also generally lacked an account for the research approach of the project. The final degree project reports reviewed do not fully meet the international expectancies of a master thesis. This critique was raised already in an earlier evaluation of the IEM programme (p 4, self evaluation report) and the programme claims to have taken some action. However, more efforts are needed.

In conclusion, the curriculum design meets the minimum requirements but needs improvement, ultimately to be demonstrated in high quality final degree project reports. This might require development work of the final degree project process itself, but also of earlier subjects and projects that provide the fundament in terms of advanced knowledge and research skills that a good final degree project will start from.

3. Staff

The staff members who teach in the programme meet the legal requirements and have the appropriate qualifications. There is a sufficient number of staff.

During the last five-year period, five lecturers (out of 11) of the programme have changed, mostly due to retirement. This is a high rate of staff turnover. However, younger

faculty have replaced the retired lecturers and the programme staff now has a good composition in terms of age of faculty.

The university provides relevant conditions for the competence development of the staff. Examples of competence development activities include courses in foreign languages, teaching methods, and engineering software. All full-time lecturers of the programme have been successfully certified by KTU for their pedagogic, scientific and public activities during the evaluation period.

The staff members have good contacts with Lithuanian industrial companies as well as with universities abroad.

The research profiles of the staff vary and are complementary. Subjects that are outside of the scope of the department, are taught by staff members from other departments, thus adding up to a staff group that covers the scope of the programme.

The interviewed students evidenced that teachers give students good access to them, and that they are very helpful. There is a strong element of personal contact between teachers and students.

4. Facilities and learning resources

The programme has access to good auditoriums and to departmental and university libraries. The teaching materials available in the libraries (textbooks, books, electronic papers, journals) are adequate and access is good.

The laboratory equipment is good already and is being further renewed. When some complementary equipment has been acquired it will constitute a very good resource for the programme.

The students have access to a sufficient number of computers which are equipped with a modern suite of mathematics, design, analysis and manufacturing software. However, the software seems to be focused on mechanical and and manufacturing engineering topics; CAD, FEM, CAM. We did not see industrial engineering specific software, that could be trained in, for example, the Manufacturing Planning and Control, Computer Aided Manufacturing Engineering and Management and Computer Integrated Manufacturing subjects, nor is the software used in those subjects specified in the study module programmes.

The Moodle e-learning system is used a majority of subjects. A skilled application of e-learning tool is particularly important in the IEM programme's case, as many students are working part or full time and cannot participate in all scheduled activities.

The programme provides sufficient spaces for individual learning. However, we were not shown any facilities nor are they described in the documentation for team-based projects. Students argued that the buildings are old and not structured for teamwork. A space for creative learning activities is needed. As noted above, such learning experiences could enhance the curriculum and would need support from adequate facilities.

The university's Career Centre provides adequate support for arrangement of student practice, including Career days and student excursions to companies.

5. Study process and student assessment

The program admits students with a bachelor's degree in Industrial or any other Engineering discipline, Physical Sciences or Management. This broad range means that the programme can assume very little about specific pre-knowledge in either of the disciplines. It is a challenge to develop the depth of knowledge characteristic for a master's degree with low requirements on specific pre-knowledge.

The self-evaluation report lists a wide range of teaching activities. The description shows that the programme is aware of the multitude of teaching activities needed to reach it learning

outcomes. However, assessing whether appropriate learning activities are constructively applied to achieve the learning outcomes of the programme would require some more specific information. For example, it is said that eight subjects apply problem based learning methods and that students solve complex and incompletely defined problems. However, no examples are provided of such projects, nor in which subjects they are included. The interviewed students and alumni asked for more practical learning activities.

Students are encouraged to do independent work and present their results in conferences for young scientists. The students may also participate in the department's research activities, typically in the research project subject or final degree project.

The students are provided with adequate opportunities for participation in student mobility programmes. The participation is low, however, a major reason being that students work part-time. The programme's efforts in promoting international mobility are commendable.

There is good support for students from teachers, administrators, Career service, and the Centre of Academic Advance. Dormitories and sports facilities are satisfactory.

The assessment system is clear and publicly available. The grade is based on a weighted contribution of different assessment components, for example exam and homework. There is no account for the relationship between these components and the learning outcomes of the subject, nor of whether learning outcomes are considered as threshold (minimum) outcomes (everyone who passes the subject should master all of the learning outcomes) or aspirational outcomes (the subject learning outcomes define an excellent performance). A clarification of the specific learning outcomes associated with each grade level would be helpful for future employers, facilitating for them to understand the difference in capabilities between "10" and "6" grade students (for example), as well as for students, who would be helped to understand what to improve if they wish to improve their capabilities in a subject.

The interviewed alumni had all easily found employment corresponding to their degree. The interviewed employers were satisfied with the level of the graduates.

6. Programme management

A programme coordinator leads the programme. A programme committee with 15 members advises the programme coordinator. The chairman of the programme committee is the Dean of the Faculty. Most of the programme committee members are professors and one is an industry representative. There is also a student representative in the programme committee.

The programme is revised annually. The roles are clear and there is a programme renewal process: the programme committee and the department can decide on minor changes, whereas essential changes are brought to the Faculty Council for approval. There are student representatives in the Faculty Council. The programme coordinator ensures that changes are implemented.

The university has a new common electronic subject evaluation system under introduction. All subjects are evaluated. Faculty members review the results, and an external representative is also involved in the discussion. Results and published internally and externally.

The university also has a graduate follow-up system in place. The data indicates that the graduates of the programme find work in both Lithuanian and international companies, and often in leading roles.

In conclusion, the programme has a good management structure and an adequate quality system. When the new electronic course evaluation system is fully operational, it will further support the programme's continuous improvement efforts.

III. RECOMMENDATIONS

1. Continue to work with the quality and depth of final degree projects to ensure that they meet international expectations of a master thesis

2. Develop one of the research project subjects into a team-based project subject, where a large complex problem is addressed

3. Develop facilities for supporting student team projects, from creative to implementation phases

4. Complement the existing suite of educational software with industrial engineering IT systems, for example ERP systems, and utilize them in subjects

IV. SUMMARY

The master programme in Industrial Engineering and Management at Kaunas University of Technology offers a generalist education. It prepares for management roles in Lithuanian industry, particularly production management. The programme offers an international perspective and has a content that is comparable with similar programmes in Scandinavia and Europe. Programme aims and learning outcomes are derived from 2nd cycle EUR-ACE specifications which further validates the programme's compliance to international standards. The graduates develop knowledge and skills that are in high demand in Lithuanian industry and quickly find employment in their field. There are adequate library, auditorium and laboratory facilities. The staff is competent. There is a positive atmosphere between teachers and students. There is a good ecosystem for the students including university support functions, dormitories and sports facilities.

The programme is challenged by the desires to both develop broad generalist skills and specialist skills. The programmes fails to demonstrates that its final degree projects meet the expectancies of demonstrated advanced specialist knowledge associated with a master thesis. It is critical for the programme to further develop the quality of final degree projects. This likely will require a selection of final degree projects which takes both scientific and industrial requirements into consideration, a final degree project process with high requirements on literature survey and research design, and a review of the curriculum design, so that it in addition to broad knowledge also development advanced knowledge in some subjects. The programme could also develop the project subject towards a higher degree of differentation and progression, for instance by basing one of the project subjects on a problem which is solved by a large student team.

V. GENERAL ASSESSMENT

The study programme Industrial Engineering and Management (state code – 621H77003) at Kaunas University of Technology 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	3
2.	Curriculum design	2
3.	Staff	3
4.	Material resources	3
5.	Study process and assessment (student admission, study process student support, achievement assessment)	3
6.	Programme management (programme administration, internal quality assurance)	3
	Total:	**17**

*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.

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Vertimas iš anglų kalbos

KAUNO TECHNOLOGIJOS UNIVERSITETO ANTROS PAKOPOS STUDIJŲ PROGRAMOS *PRAMONĖS INŽINERIJA IR VADYBA* (VALSTYBINIS KODAS – 621H70003) 2012-12-20 EKSPERTINIO VERTINIMO IŠVADŲ NR. SV4-173 IŠRAŠAS

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V. APIBENDRINAMASIS ĮVERTINIMAS

Kauno technologijos universiteto studijų programa *Pramonės inžinerija ir vadyba* (valstybinis kodas – 621H77003) vertinama **teigiamai**.

Eil. Nr.	Vertinimo sritis	Srities įvertinimas, balais*
1.	Programos tikslai ir numatomi studijų rezultatai	3
2.	Programos sandara	2
3.	Personalas	3
4.	Materialieji ištekliai	3
5.	Studijų eiga ir jos vertinimas	3
6.	Programos vadyba	3
	Iš viso:	**17**

* 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

Pramonės inžinerijos ir vadybos magistro studijų programa Kauno technologijos universitete suteikia bendrąjį išsilavinimą. Ji rengia specialistus vadovaujančioms pareigoms Lietuvos pramonėje, ypač - gamybos vadybos srityje. Programoje siūlomas tarptautinis požiūris, o jos turinys yra panašus į programų vykdomų Skandinavijoje ir Europoje turinį. Programos tikslai ir studijų rezultatai suformuluoti pagal 2-osios pakopos EUR-ACE kriterijus, tokiu būdu patvirtinant programos atitiktį tarptautiniams standartams. Absolventai vysto žinias ir įgūdžius, kurie yra itin paklausūs Lietuvos pramonėje, todėl greitai randa darbą savo srityje. Studentai gali naudotis tinkama biblioteka, auditorijomis ir laboratorijų įranga. Personalas yra kompetentingas. Tarp dėstytojų ir studentų vyrauja teigiama atmosfera. Studentams sukurta gera aplinka, įtraukiant universiteto paramos paslaugas, bendrabučius ir sporto bazę.
Programos iššūkis yra siekis išugdyti tiek plačius bendruosius, tiek specializuotus įgūdžius. Programos vykdytojams nepavyksta įrodyti, kad baigiamieji projektai atitinka su magistro laipsnio darbais siejamus lūkesčius pademonstruoti pažangias specializuotas žinias. Programai labai svarbu toliau gerinti baigiamųjų projektų kokybę. Tikėtina, kad norint tai padaryti reikės atrinkti baigiamuosius projektus, kuriuose būtų atsižvelgta tiek į mokslinius, tiek į pramonės reikalavimus, peržiūrėti baigiamojo projekto eigą taikant aukštus reikalavimus literatūros apžvalgai ir mokslinio tyrimo sandarai bei peržiūrėti studijų sandarą, kad be plačių žinių, būtų suteikiamos ir tam tikrų kitų dalykų pažangios žinios. Programos vykdytojai taip pat galėtų labiau išvystyti projekto dalyką ir pasiekti aukštesnį diferenciacijos ir sudėtingumo lygį, pavyzdžiui, vienam iš projekto dalykų pasirenkant problemą, kurią spręstų didelė studentų komanda.

III. REKOMENDACIJOS

1. Tęsti darbą gerinant baigiamųjų projektų kokybę ir išsamumą, kad baigiamieji projektai pateisintų su magistro baigiamaisiais darbais susijusius tarptautinius lūkesčius.

2. Vieną iš mokslinio tyrimo projekto dalykų išplėtoti iki komandinio projekto dalyko, kuriame būtų nagrinėjama sudėtinga problema.

3. Aprūpinti studentus reikiamais ištekliais komandiniams projektams vykdyti nuo kūrybinio iki įgyvendinimo etapų.

4. Papildyti turimą mokymo programinės įrangos paketą pramonės inžinerijos IT sistemomis, pavyzdžiui, ERP sistemomis, ir panaudoti jas studijų dalykuose.

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Paslaugos teikėja patvirtina, jog yra susipažinusi su Lietuvos Respublikos baudžiamojo kodekso[1] 235 straipsnio, numatančio atsakomybę už melagingą ar žinomai neteisingai atliktą vertimą, reikalavimais.

Vertėjos rekvizitai (vardas, pavardė, parašas)

[1] Žin., 2002, Nr.37-1341.