**The Modern Mechanical Technologies Study Unit at Turku University of Applied Sciences**

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Abstract

Modern technologies study unit is a special one-year training designed for mechanical engineering students at Turku University of Applied Sciences. The purpose of the course is teaching modern metal working methods for a select group with state-of-the-art equipment. In addition, the course gives the students opportunities for familiarizing themselves with working with experts and various stakeholders in a professional setting.

1. Introduction

This study concerns the way of organizing Modern Technologies course with related activities at Turku University of Applied Sciences.

1.1.Turku University of Applied Sciences

Turku University of Applied Sciences (TUAS) has over 30 degree programmes in 6 faculties, and the total number of full-time students is about 7,000. TUA S offers over 30 degree programmes of 210–270 ECTS credits during the academic year2009–2010. Some 1,800 students were selected out of circa 8,500 first-choice applicants for degree programmes starting in the autumn of 2009.In degree programmes starting in January, there are approximately 200 study places. The total amount of students at TUA S is about 7,000 fulltime students plus circa 1,500 students in continuing education. One of the faculties, Technology, Business and Enviroment, houses most of the engineering degree programmes in TUAS, including the Degree Programme in Mechanical Engineering.

1.2. Machine Technology Centre Turku Ltd

The centre for mechanical engineering is a joint education and development centre of the educational institutes and enterprises in Turku area. Machine Technology Centre Turku Ltd (KTK), established by the City of Turku together with approximately 80 companies in the SME sector, has as its mission to offer the local companies a possibility to become familiar with modern production technology of metal and mechanical engineering. Education institutes of the area - Turku Vocational Institute (AI), the Turku Vocational Adult Education Centre (AKK) and Turku University of Applied Sciences (TUAS) - have committed themselves to the activities of KTK. Moreover, the aims of KTK include offering the students a state-of-the-art learning environment.

2. Modern Technologies Study Unit

The Modern technologies study unit consist of the course and modules which are supporting the study unit, called Engineer Workshop. The designing of the study unit started on spring 2008, and the first course started in September 2008.

The purpose of modern technologies training and the engineer workshop model is to activate the students by providing them with an extensive machinery training and then to engage them into enriching their skills as training assistants and workers on assignments through theses and projects and as subcontractors.

Each year, 15 students starting their third year of studies are selected to modern technologies training from different specializations of the degree programme in mechanical engineering. During the first semester, the students acquaint themselves with the use of all machinery (FMS, robot welding cell, plate working and punching and laser cutting cell), and on the second semester, they specialize in one of them. During their fourth year of studies, the mechanical engineering students work at KTK.

During the development phase, three engineering theses were also produced; one handled the organizing of the engineer workshop and two handled the use of the machine modules.

2.1. Description of the Development Path and Current Implementation

A planning group designed a course for the third-year students during which they are trained to become specialists in different manufacturing equipment. A training plan is made for the students. The duration of the course is one academic year and its extent is 10 ECTS credits.

The students (a total of 15) are selected on the basis of their interest, work experience and study performance. The first course was started in autumn 2008 and ended in spring 2009. Because the training environment is very challenging, the first course was implemented with a number of experts working with groups of 5 students. After the first course, the students who have taken the course as third-year students will work as assistants on the course on the following year. One part of the group trains the new third-year students while another part works on the external assignments. This way the training can be continued and, to a great extent, led by students. On the other hand, there always are 15 + 15 skilful students at KTK in the future. This ensures meeting the labour resource needs of KTK.

2.2. Resources

In the development project, the resources for the training of the first group were considerably greater than in normal courses. The budget for the first course was more than € 20 000. In the course, the manufacturing equipment was taught by a teacher specialized in that group. In addition, resources were reserved for the laboratory engineers at KTK. They were needed firstly for detailed instruction and secondly for ensuring safe working with the machinery.

2.3. Essential Results

* implementation programme for modern technologies study unit further developed on the basis of the feedback (so far, student feedback has been positive)
* engineer workshop in which the students work on the assignments; training, theses, projects for enterprises
* the principle of nonstop training, for ensuring the critical number of specialists in the Machine Technology Centre in a feasible way (third- and fourth-year students always available)
* organising model for the engineer workshop (the cooperative model) and the functioning principles that are to be tested
* additional training material for demanding machine environments
* every year 15 capable experts on production engineering graduate, ready to contribute to the development of the industries
* the student acquires a profound and practical understanding of his/her field while familiarizing him/herself with enterprising and begins networking while still studying
* To create specialists of metal working methods with knowledge of customer relations and demands of the industry
* To give a possibility for successful students to get more specific education for deeper engagement in their engineering studies and create multi-skill engineers for further use in R&D projects.
* To use, theoretical, practical and financial way of working in the course, and also at the same time improves the Centre as an effective environment for the use of institutes.
* To integrate industry and their demands to education
* To use assistant from previous course as additional lecturers and that way reduce the expenses

Table 1: Target Model for Future Activities

TUAS

Modern Tech. Study Unit

Assistants

Marketing students

Engineer workshop

KTK

Industry

3. students/year

15 students / year

9-12 students/ year

3-6 students/

year

Marketing the products

Order the product product

Contract to product

ready product

3.Conclusions

At this stage of the process, the third group of 15 third-year students are acquiring general knowledge on all the machinery at KTK. In the autumn 2011, they will work as assistant trainers of the next group and complete orders from the industry in the engineer workshop (projects, theses, subcontracting). The engineer workshop is led by a foreman chosen from the student group. The assistant contracts for the next autumn are made every spring.

3.1. SWOT Analysis

Strengths:

+ excellent motivation of the students (a select group)

+ the students are provided with strong skills in a modern new technology environment

+ possibility for versatile learning (technology, entrepreneurship, teamwork)

+ the students are a strong assistant trainer resource

+ every year 15 highly skilled experts are produced for work in production engineering

Weaknesses:

- an expensive initial phase (training, machinery purchases)

- the effects of recession or changes in industrial life for the operational preconditions

- it is not possible to include all interested students

Threats:

-maintaining the operational preconditions in a weakening economical setting (maintaining the equipment)

-establishing the position as a credible business partner (the engineer workshop of KTK/the business world)

Opportunities:

+ the operational model of the engineer workshop as a cooperative "enterprise"

+ expansion to other fields of education (business students marketing the activities etc.)

+ to produce specialist know-how for the production engineering environment

+ to build versatile networks

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