Report - IL2206 - 2024-11-11

Respondents: 1
Answer Count: 1
Answer Frequency: 100.00%

Please note that there is only one respondent to this form: the person that performs the course analysis.

Course analysis carried out by (name, e-mail):

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DESCRIPTION OF THE COURSE EVALUATION PROCESS
Describe the course evaluation process. Describe how all students have been given the possibility to give their opinions on the course. Describe how aspects regarding gender, and disabled students are investigated.

All students were invited to participate in the KTH learning experience questionnaire (LEQ) with 12 questions. The LEQ summary also gives separate diagrams based on gender, type of student, or disability. The LEQ also allows writing free comments. A course committee meeting was offered but could not be held since no students replied and registered for the course committee meeting. The LEQ was arranged after the exam was graded and reported.

In addition, a course committee meeting was conducted on Monday, Nov 11, 2024, after the completion of the LEQ.

DESCRIPTION OF MEETINGS WITH STUDENTS
Describe which meetings that has been arranged with students during the course and after its completion. (The outcomes of these meetings should be reported under 7, below.)

A course committee meeting consisting of the course responsible, three TAs, and three students was conducted on Monday, Nov 11, after the completion of the LEQ. During this meeting, the results of the LEQ, the current structure of the course and possible improvements were discussed. The meeting had a duration of 90 minutes.

COURSE DESIGN
Briefly describe the course design (learning activities, examinations) and any changes that have been implemented since the last course offering.

The course consists of 17 lectures (2h), 2 seminars (2h) and 3 laboratory sessions (4h). To pass the course, both the written exam (grades: A-F), focusing on the theoretical aspects, and the laboratory course (grades: P, F) have to be passed. The seminars were part of the laboratory course. The written exam also determines the grade of the course. The laboratory course focuses on the practical real-time aspects of embedded single-processor systems.

The role of the seminars is to strengthen the laboratories and to allow more time for the theoretical part of the course. The seminars focused purely on the preparation of the laboratories.

The students borrow donated Intel FPGA boards, which they can use for the course. In the second laboratory, the students have to implement an application using a commercial real-time operating system (MicroC/OS-II). To finish the two laboratory tasks, three lab sessions are allocated. The course is the first one in the master program "Embedded Systems" with many international students.

The course has worked well in previous years. The course has been designed for around 100 students each year at the advanced level.

Due to the large laboratory part, the course requires a large number of laboratory assistants. This year, three PhD students conducted the seminars and the laboratory sessions.

THE STUDENTS' WORKLOAD
Does the students' workload correspond to the expected level (40 hours/1.5 credits)? If these is a significant deviation from the expected, what can be the reason?

According to the answers of the students in the learning environment questionnaire, the workload is reasonable. The average workload lies a little bit below 20 hours per week, but there are also students who put 33-35 hours per week, which is the maximum reported in the LEQ.

THE STUDENTS' RESULTS
How well have the students succeeded on the course? If there are significant differences compared to previous course offerings, what can be the reason?

Students perform well in this master course. A clear majority of the students pass the written exam and the laboratory course.

STUDENTS´ANSWERS TO OPEN QUESTIONS
What does students say in response to the open questions?

It is very difficult to summarise the answers to the open questions. Many students pointed out that the course was well organised and had interesting lectures and laboratories. The lecture notes were seen as a positive addition to the course.

SUMMARY OF STUDENTS' OPINIONS
Summarize the outcome of the questionnaire, as well as opinions emerging at meetings with students.

The KTH learning experience questionnaire has been used for the evaluation. The questionnaire has 12 questions, where students give marks from 1 (strongly disagree) via 4 (neutral) to 7 (strongly agree). The questions are grouped into the following three areas.

This year, 33 out of 100 students participated in the questionnaire, which is a larger percentage than in the previous year. The system sends several reminders to the students.

1. Meaningfulness - emotional level (Questions 1-6)

The course received very high marks in this area (between 5.9 and 6.2). According to the evaluation, students worked with very interesting issues (Q1: 6.0), and the course was challenging in a stimulating way (Q4: 5.9).

2. Comprehensibility - cognitive level (Questions 7-16)

Also in this area, the course generally achieved very high marks (between 6.0 and 6.6). Students viewed the course to have well-defined learning outcomes (Q7: 6.2). They found the subject and the presentation very understandable (Q10: 6.2, Q11: 6.6), where they could learn from concrete examples (Q10:6.2) and where the understanding of key points had high priority (Q11: 6.6). The course furthermore was regarded to have a good alignment between the learning activities and the intended learning outcomes (Q12: 6.3). Students are in general satisfied with the delivery of the feedback (Q15: 6.0) and regarded the assessment on the course as fair and honest (Q16: 6.7).

3. Manageability - instrumental level (Questions 17-22)

The course achieved in general very high marks (between 6.1 and 6.5) in this area. Students regarded their background knowledge as sufficient (Q17: 6.4) and could learn in a way that suited them (Q19: 6.2). They liked that they could collaborate and discuss with others (Q21: 6.5), and pointed out that they were able to get support when needed (Q22: 6.1).

The evaluation results did not change much from the previous years.

OVERALL IMPRESSION
Summarize the teachers' overall impressions of the course offering in relation to students' results and their evaluation of the course, as well as in relation to the changes implemented since last course offering.

In general, the course seems to run very well, and students perform in general very well in the course. Also, students find the course interesting and think that the course has a good structure.

On the administrative side, the course requires a lot of resources and effort from the teaching staff because of the practical laboratories, where students can borrow FPGA hardware boards. Although the course has been evaluated very well, the students point out that there were some issues in the laboratory course due to the relatively old FPGA boards and the software that is installed on a virtual machine. This virtual machine causes a problem for students with modern Apple computers with M1-M4 processors, since they use another instruction set that the virtual machine. The issue has been solved for this year by pairing students, so that there never have been two students in a group with a modern Apple computer. However, the course faces a big challenge in the laboratory part due to old (but still powerful) and expensive hardware in the form of FPGA boards, and software issues due to the modern Apple computers. It is very important to note that many embedded and electronic system design tools only support Windows and Linux, but not Apple's operating system.

ANALYSIS
Is it possible to identify stronger and weaker areas in the learning environment based on the information you have gathered during the evaluation and analysis process? What can the reason for these be? Are there significant difference in experience between:
- students identifying as female and male?
- international and national students?
- students with or without disabilities?

It seems that the course has succeeded in creating a stimulating and positive learning environment for the students. This is particularly important because IL2206 Embedded Systems is the first course in the KTH master program "Embedded Systems" with depending on the study year between 80 and 150 students, where the major part are international students, who have never studied at KTH before. The course seems to have a clear organisation and structure, which is well aligned with the intended learning outcomes. Students view that the subject is presented in a clear manner and the assessment of the course is fair.

There are no big differences between the answer scores of international master, exchange and Swedish students. The evaluation of the male students (lowest score Q4: 6.0, highest score Q16: 6.8) showed a similar variance as the one of the female students (lowest score: Q4, Q19: 5.8, highest score: Q11: 6.7). Also, there wer not any larger differences between international and Swedish students (here for all groups the minimal grade was 5.6 and the highest was 6.8).

One female student reported "No gender inconveniences", otherwise there were no further comments.

There have been two comments of Swedish master students, who pointed out that they did not have the programming language C in the bachelor, which they viewed as disadvantage for the course.

PRIORITIZED COURSE DEVELOPMENT
What aspects of the course should be developed primaily? How can these aspects be developed in short and long term?

Based on the LEQ results, from the student perspective, the course seems to work very well and can be given in the same form next year.

However, the laboratory course requires very large resources and effort from the teaching staff. There are now issues with the new Apple computers, which do not support the virtual machine that is used for the laboratories. Furthermore, the number of working donated boards is decreasing, and since the boards are not in production anymore, they cannot be directly replaced.

Thus, it is of key importance to rethink the laboratory course. Very likely, the course has to switch to another hardware or simulation enivronment that is working on all operating systems and the KTH computer laboratories. Here, there is an additional challenge that the software tools should not require administrator rights to access the hardware, since this will cause problems on the laboratory computers.

Also, in the present form, the course requires extensive support from the course staff since hardware and accompanying software are complex. A future version of the course has to take this into account and needs to significantly lower the required support from the course team.

In addition, the students mentioned in the course committee meeting mentioned that the course already has a very good structure. However, an even stronger focus should be put on the connection between the hardware and the software, which could be more emphasised in the laboratories. The main suggestions were that the Ada laboratory should ideally also target an embedded hardware platform, and that the RTOS laboratory could ideally also deal with interrupts and memory management.