Report - IL2206 - 2022-12-15

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 learning experience questionnaire (LEQ) of KTH with 12 questions. The LEQ summary also gives separate diagrams per gender, type of student, or disability. The LEQ also gives the opportunity to write free comments. In addition, a course committee meeting was offered, which was held on November 21, 2022.

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 was held on November 21, where 3 master students, 3 TAs, and the course responsible were present. The discussion was based on the results of the LEQ.

The meeting concluded that the course has a very suitable structure, but that some details could be improved. The lectures and lecture notes work very well, and the structure for the laboratories and the seminars is good. The different parts contribute to a good understanding of the topic of embedded systems. Suggestions for improvement were discussed and will be stated under 'Prioritized Course Development'.

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 determines also the grade of the course. The laboratory course focuses on the practical real-time aspects of embedded single-processor systems.

There have been no major changes in the course. Only the seminars were conducted in a slightly different form, where four students built a seminar group, which discussed the questions with a TA.

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 we have used four PhD students to conduct 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. Most students work around 20 hours per week. However, there is a clear variation between the workload hours reported by the students.

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. Most students liked the idea of the seminars but also gave suggestions for improvement. 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.

32 students participated in the questionnaire.

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

The course received very high marks in this area (between 5.9 and 6.0). 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 5.5 and 6.3). Students viewed the course to have well-defined learning outcomes (Q7: 6.3). They found the subject and the presentation very understandable (Q10: 5.9, Q11: 6.3), where they could learn from concrete examples (Q10:5.9) and where the understanding of key points had high priority (Q11: 6.3). The course furthermore was regarded to have a good alignment between the learning activities and the intended learning outcomes (Q12: 5.9). Students are in general satisfied with the delivery of the feedback (Q15: 5.5) and regarded the assessment on the course as fair and honest (Q16: 6.3).

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

The course achieved in general very high marks (between 5.8 and 6.2) in this area. Students regarded their background knowledge as sufficient (Q17: 6.1) and could learn in a way that suited them (Q19: 6.2). They liked that they could collaborate and discuss with others (Q21: 6.1), and pointed out that they were able to get support when needed (Q22: 5.8).

The following issues were discussed in the course committee meeting including suggestions for improvement.

==> Positive comments
- The course gives a good start for embedded systems design
- The students in the course committee perceived physical teaching much better than teaching via Zoom
- The course structure (lectures, seminars, and laboratories) works very well
- The lectures were very good and had good lecture notes. They also present how systems are currently designed in the industry.

==> Suggestions for improvement
- Short guest lectures from industry could be conducted as part of the lecture.
- Better references in Canvas to lecture notes pages.
- The quality of the discussion in the seminars varies and depends to a large extent on how well the student is prepared. Should there be a stronger incentive for good preparation, for instance, in the form of bonus points?
- The number of open questions should be reduced to allow for a deeper understanding during the preparation and a deeper discussion during the seminars.
- Should there be an incentive for well-conducted laboratories, for instance, in the form of bonus points for optional tasks?
- There is a limit of FPGA boards, which means that two students share one board.
- The exam was considered fair, but some students pointed out that they were short on time during the exam.

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 good 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. However, a few details could be improved, which will be discussed under 'Prioritized Course Development'.

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.

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 male students (lowest score: Q4: 5.8, highest score: Q17: 6.5) are more positive than the female students (lowest score Q22: 4.8, highest score Q1: 6.0). Still, both groups of genders are clearly on the positive side. Also, there have been positive comments from female and male students in the evaluation form with respect to equal treatment.

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

The course committee concluded that the course in general works very well and can be given in the same form next year. However, several important suggestions for additional improvements have been suggested. Within these suggestions, the course responsible suggests prioritising the following course development aspects.

1. Should there be further incentives, for instance, in the form of bonus points, for well-prepared and conducted seminars and laboratories? Should there be optional tasks for the students who aim for a higher grade?
2. The laboratory course requires very large resources and effort from the teaching staff. Also, the number of working donated boards is decreasing, and since the boards are not in production anymore, they cannot be directly replaced. It has to be investigated how the laboratories can run more efficiently, because the current setup using a limited number of donated FPGA boards and a complex software structure is fragile and requires a lot of operational effort from the course staff.