Course Analysis IS1300

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

Matthias Becker
mabecker@kth.se

COURSE DESIGN

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

The course starts with an introductory lab assignment "PingPong" that introduces the students step by step to the Integrated Development Environment (IDE) that is used in the course, as well as to Test Driven Development and code documentation.

The course includes two seminars that focus on hardware development for embedded systems and software development for embedded systems respectively. Both seminars are connected to the project task PRO1 and prepare the students for this.

The project focuses on the development of an embedded system where hardware is provided by the teacher and students develop the software. The project is then basis for PRO1 that also determines the grade of the student on a scale A to F.
The grade for the project and PRO1 is determined based on:

- Panning, architecture, structure, testing and documentation
- Complexity of the project (several features are requested from the students and can be selected. The composition of realized features determines the points for this part)
- Written report
- Utilizing a Real-Time Operating System for the project

The theoretical part of the course is originally structured in 7 lectures (see below for changes in this year's instance). The lectures cover all aspects of the embedded systems development, but focus most on hardware, software and real-time aspects.
The written exam has a Pass/Fail grade which is also required to pass the course.

Due to Covid-19 the course had been significantly restructured to facilitate remote teaching. A flipped Classroom approach was implemented. The course material was logically divided into 6 thematic modules that were then supported by multiple pre-recorded lectures (each) as well as written material.
All slides of the course were re-developed. Some of the slides are based on previous slides while many slides are significantly re-developed.

The first lecture was given online live and has additionally been recorded.

For every lecture that was originally scheduled a Q&A session was offered remotely which was also linked to the thematic modules prepared for self-study.
To provide structure to the self-study a suggested work schedule was prepared for each of the course weeks that provided suggested timeframes to indicate intended work with each of the course elements (provided in textual from as Gant chart for each week).

The practical course elements were conducted remotely as well. This did not require the same amount of restructuring than for the theoretical part as students in this course always use their own computer to develop the embedded software, work individually and borrow the lab equipment for the course duration.
Instead of physical lab-session remote sessions were organized in the following forms:

- One initial live lab-session open to all students. This was intended to provide support with initial problems that might arise when installing software and getting everything setup.
- Demonstration (3x) of the individual parts was conducted remotely via Zoom where students had to pre-book timeslots for presentation. Additionally source code was submitted via Canvas.
- All remaining lab sessions were used for questions. For this the system "Stay a While" (https://queue.csc.kth.se/) was utilized to enable students to ask individual questions.

34 out of the 53 students registered in LADOK wrote the exam on January 8th.
30 of the students that wrote the exam achieved a passing grade and 4 students did not.
2 of the registered students had already passed the exam in a previous course instance.
6 students were active in the course and passed PRO1 but did not participate in the exam.
13 registered students did not actively participate in any of the course elements.

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?

The course analysis showed that one student spent 39-41 hours/week on the course. The majority of the students who answered the course analysis required around 20 hours/week which is as planned.
Students who provided written feedback highlighted that challenges that lead to longer time spent on the course might be attributed to insufficient pre-requisites (for example C programming or Electronics). This might be the case because students of several programs can take the course. It was also pointed out that the course includes several intermediate deadlines that require continuous work.
In total 13 students answered the course analysis (23%).

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?

The course results are good and in line with the results and grade distribution of previous years.
All students who actively worked with the project have passed PRO1. The exam focuses on the theoretical aspects of the course was passed by most students who worked with the course material (88% of the students who wrote the exam passed 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.

This was the first instance after the course responsibility was transferred from Bengt Molin to Matthias Becker in February 2020. The course could successfully accommodate the changes required for distance education. This can also be seen from the polar diagram which shows a positive impression by the students.
Most evaluation criteria achieved a good result (between 5,9 and 6,4).
3 evaluated points were judged less positive at 4,7, 4,8 and 4,7 respectively (Nr. 5, 20 and 21). Nr. 5 and Nr. 21 evaluated the interaction and collaboration between students which is hampered due to the Covid-19 pandemic as it was also pointed out by students answers to these points.
Nr. 20 evaluated the opportunity to influence course activities. The feedback for this part covers the complete spectrum with most students evaluating it positively. Student comments for Nr. 20 further show that student feedback was used during the course to adjust parts dynamically. Other students indicated in the overall written feedback a wish to be able to suggest own features/requirements to the project.
The average of all evaluated criteria is 5,99.

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?

The learning environment is seen positive. The modifications due to the required change to distance education was successful. Based on the written feedback by students the students appreciate the practical nature of the course as well as the provided lectures.
Students also suggested in the written feedback that open zoom rooms could be used to enable student to student interactions (possibly supervised).

There was no apparent difference between answers of different student groups in the course evaluation.

PRIORITIZED COURSE DEVELOPMENT

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

For the next course instance in P2 HT21, the syllabus is planned to be updated.
This is mainly to more concisely describe the course content and intended learning outcomes (currently there are 11 ILOs). But also to adjust the content of the course to strengthen the theoretical part. This need was identified after surveying course syllabi of equivalent courses at other national and international universities.

A new project will be designed that will utilize the existing hardware platform.
More focus will be put on the usage of a Real-Time Operating System (RTOS) in the project. A switch from FreeRTOS to ThreadX is planned. ThreadX is a certified RTOS that is currently being integrated into the software tools used in the course (STM32Cube Ecosystem by ST Microelectronics). Support for the platform used is planned by ST Microelectronics for Q2/Q3 2021.

Depending on the recommended teaching situation in P2 2021 (remotely or on campus) the lectures will be adjusted accordingly. Independently all lectures will be evolved successively.