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ML2308 CDIO course in Sustainable Production Development 15.0 credits

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.

The course was evaluated using an LEQ survey with a response rate of 7/15 representing 47% of participants. The LEQ was available to students between December 8 and 22 of 2023.

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.)

I presented information about the course and its evaluation on August 29. Additionally, I highlighted the importance of providing feedback to the course on December 7, 2023.

COURSE DESIGN

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

Course ML2308 includes seven learning outcomes and four examination moments.

The learning outcomes comprehend

ILO 1 - visa förmåga att behärska hela utvecklingsprocessen utforma – analysera – testa – utvärdera för att metodisk utveckla lösningsförslag för ett komplext problem inom området hållbar produktionsutveckling.

ILO 2 - ha kunskap om etablerade designmetoder och verktyg, för att kunna identifiera områden för förbättringar av ny eller befintlig lösning förett komplext problem inom området hållbar produktionsutveckling.

ILO 3 - visa förmåga att inom en given tidsram planera och genomföra ett gruppbaserat tekniskt utvecklingsprojekt inom området hållbar produktionsutveckling, med olika roller och teknisk expertis i projektgruppen.

ILO 4 - demonstrera förmåga att i grupp, både muntligt och skriftligt, tydligt redogöra för och diskutera sina koncept, prototyper, lösningar, slutsatser och de fakta och argument som dessa bygger på, med huvudintressenter och andra projektgrupper inom ramen för det tekniska utvecklingsarbetet.

ILO 5 - ha kunskap om och förmåga att visa hur den utvecklade lösningen kan implementeras och driftas i en industriell produktions- och logistikkontext.

ILO 6 - visa förmåga att göra bedömningar med avseende på relevanta sociala, socio-ekonomiska och etiska aspekter, både ur ett lokalt och globalt perspektiv.

ILO 7 - visa de färdigheter som krävs för att delta i utvecklingsarbete samt implementeringen och driften av den utvecklade lösningen, för att självständigt kunna arbeta i avancerad industriell verksamhet.

The four assessment of ML2308 include includes a report, presentation, prototype, and video. Where the evaluation of learning outcomes is the following.

The report evaluates ILOs 1, 4, 6, and 7.

The presentation evaluates ILOs 2 and 3.

The prototype evaluates ILOs 3, 5, and 6.

The video evaluates ILO 6.

Completion of all learning outcomes for all examination moments is mandatory to pass the course. The course is evaluated in an A to E scale.

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 extent of students work are estimated to correspond to the course's points (40 hours / 1.5 credits). The results of the LEQ show that two students worked between 21 and 23 hours / week. One student worked 18 to 20 hours / week. Three students worked 15 to 17 hours / week. One student worked 12 to 14 hours / week.

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?

There are no significant differences with the success rate of students compared to previous years. All students passed the course.

STUDENTS´ANSWERS TO OPEN QUESTIONS

What does students say in response to the open questions?

No.	Question	Response
1	I worked with interesting issues	6
4	The course was challenging in a stimulating way	5,6
7	The intended learning outcomes helped me to understand what I was expected to achieve	5,3
10	I was able to learn from concrete examples that I could relate to	4,4
11	Understanding of key concepts had high priority	5,3
12	The course activities helped me to achieve the intended learning outcomes efficiently	4,7

15	I could practice and receive feedback without being graded	5,7
16	The assessment on the course was fair and honest	4,6
17	My background knowledge was sufficient to follow the course	5,4
19	The course activities enabled me to learn in different ways	4,9
21	I was able to learn by collaborating and discussing with others	5,4
22	I was able to get support if I needed it	5,7

SUMMARY OF STUDENTS' OPINIONS

Summarize the outcome of the questionnaire, as well as opinions emerging at meetings with students

Students found that the best aspects of the course included

- Working with real companies
- Team work including students and company representatives
- Develop engineering skills in a real-life environment
- Experiential learning
- Applying theoretical knowledge acquired during the master's degree

Suggestions for improvement

- Improving supervision moments in the course
- Clarify CDIO methodology from the perspective of the teachers
- Clarify intellectual property rights

Student advice for future students included

- Match your effort on the development of the prototype with the requirements of the company
- Prioritize the conception and design of your project
- Create a contingency plan for possible risks
- Think that a production system includes many sub-systems and that your solution should include these

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

Students had an overall positive impression of the course, and identified areas for improvement. This is the fourth time KTH offers the course. The teachers are in agreement with the suggestions proposed by students including supervision moments, presentation of the CDIO methodology in a lecture, and clarifying intellectual property rights. Future changes will address these concerns.

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 LEQ survey reveals the following strong and weak areas for ML2308

Strong areas included

- I worked with interesting issues 6
- I could practice and receive feedback without being graded 5,7
- I was able to get support if I needed it 5,7
- The course was challenging in a stimulating way 5,6
- My background knowledge was sufficient to follow the course 5,4

Weak areas comprehended

- Understanding of key concepts had high priority 5,3
- The course activities enabled me to learn in different ways 4,9
- The course activities helped me to achieve the intended learning outcomes efficiently 4,7
- The assessment on the course was fair and honest 4,6
- I was able to learn from concrete examples that I could relate to 4,4

PRIORITIZED COURSE DEVELOPMENT

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

Changes of the course before this course offering

The changes to the course included four aspects based on the feedback of students from the previous year. Students in ML2308 for HT2022 highlighted four areas of improvement:

1. Improve feedback to students beyond showing the latest update of the project
2. Allow students to form their own groups
3. Discuss with companies the competence of students and their abilities, and select projects that align with the master's program
4. Assign topics for team presentations that align with the CDIO methodology

ML2308 in HT2023 included the following changes.

Student comment 1: Improve feedback to students beyond showing the latest update of the project

Change 1: We modified the design of the course from previous years. The new version of the course included four mandatory non-graded assessments. The purpose of this non-graded assessments are to provide feedback during the project of the students. These evaluation were spread throughout the course and represented milestones corresponding to the learning of the students. Specifically, non-graded assessments focused on helping students develop their knowledge about the conception, design, implementation and operation of a prototype.

Students presents their preliminary results in each non-graded assessment. Then, the examiner and course responsible provided feedback based on the grading criteria of ILOs in

the course. Our comments focused on pointing out the opportunities for achieving at least an E level grade, and then referring to opportunities for achieving higher grades. The non-graded assessment occurred on site and other students in the course provided feedback in addition to that of the examiner and course responsible.

Student comment 2: Allow students to form their own groups

Change 2: This edition of the course presented changes to the composition of student groups. On the one hand, students formed their own groups for the first graded assessment of the course consisting of a student presentation about basic knowledge on the CDIO methodology. Additionally, students in a group designed and presented an active learning activity related to their topic. On the other hand, the examiner and course responsible assigned students to a project. We gave precedence to diversity in the composition of students including background, nationality, gender, and bachelor's degree. We focused on matching the competence of students to the needs of each project and company.

Student comment 3: Discuss with companies the competence of students and their abilities, and select projects that align with the master's program

Change 3: Addressing this comment required a comprehensive change to the scope of projects. We made a conscious choice of selecting project exclusively on the area of sustainable production development. Additionally, we discarded projects giving precedence to the design of products.

For the selection of projects, we relied on a collaboration with the Södertälje Science Park, and gave precedence to small and medium-sized companies in manufacturing. We visited companies four months before the start of the course, described the competence of the students, and formulated a problem of academic and practical relevance. We iterated with companies the definition of a problem in the project. Finally, we documented the problem formulation and presented this to both companies and students.

Student comment 4: Assign topics for team presentations that align with the CDIO methodology.

Change 4: Students presentations of this year focused on the four areas of the CDIO methodology including conception, design, implementation and operation. We gave precedence to the activities of each task as a guide to the content of the presentation. This represents a change to the presentation of students from previous years that focused on ethics and social sustainability perspective.