

Course analysis for course ML2300 Sustainable Production

Period: Period 1, 2020.

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Examining moments:

- INL1 (A-F, 3 hp).
- ÖVN1 (P/F, 3 hp).
- TEN1 (A-F, 3 hp).

1. Description of the course evaluation process

As in the last year's course round, two opportunities were provided to students for the purpose of the course evaluation. The first one was during course conclusion when students could anonymously provide opinions using Mentimeter administered by student representative in a classroom environment. The second was done using KTH LEQ platform (after final exam has been conducted) in which they were sent automatically generated email to fill out the anonymous course evaluation. These two, together with reflections made throughout the course, are the bases for this course analysis.

2. Statement of meetings held with students

- Continuous improvement meetings - multiple times during the course for quick fixes as needed.
- Meeting at course conclusion to discuss collected opinions.
- End-of period (P1) meeting called by master program responsible to hold discussion among course examiners, course responsible and student representatives.

3. Course design/structure

The course has six learning objectives:

1. *Describe how the different subject areas production management, production logistics and industrial operational reliability relate to sustainable production development.*
2. *Account for motives, driving forces and obstacles for sustainable production.*
3. *Explain and analyse the sustainable production system where environmental aspects and other sustainability aspects have connections to the system components and relations.*
4. *Evaluate, analyse and compare alternatives for development of production, considering economic, environmental and social sustainability, based on established methods and tools.*

5. *Relate a sustainable production to sustainability aspects regarding product supply chains and transport.*
6. *Discuss the role of production for an increased life-cycle perspective and circular material and energy flows.*

To assess the achievement of these learning objectives, three assessment moments have been set in the course. These are:

INL1 (A-F, 3 hp). Group assignment. Case based continuous in course with written hand-in.

ÖVN1 (P/F, 3 hp). Three exercises. Literature based seminar tasks in 3 sessions focusing Production management, Production logistics and Sustainability.

TEN1 (A-F, 3 hp). Written final exam to assess theoretical understanding.

The relationship of the ILOs and the assessment moments are given in the matrix below.

<i>ILOs</i>	<i>INL1</i>	<i>TEN1</i>	<i>ÖVN1</i>
ILO1		X	X
ILO2		X	
ILO3	X		
ILO4	X		
ILO5		X	X
ILO6		X	X

Final grading has been set to be a combination of INL1 and TEN1 as shown in the table below with the condition that pass grade is achieved in ÖVN1.

<i>INL1 (3hp)</i>	<i>TEN1 (3hp)</i>				
	A	B	C	D	E
A	A	A	B	C	D
B	B	B	B	C	D
C	B	C	C	C	D
D	C	C	D	D	E
E	D	D	D	E	E

4. Students' work effort time in relation to points

In 2019 students reported that they spent a work load of some 24-46 hours a week for this course. The in 2020 the range of responses seems to have broadened (8-32 hrs per week) and obviously both the minimum and maximum hour spent seems relatively lower compared to previous year.

5. Students' results

Below is a descriptive comparison of student results in the HT20 course round compared to the HT19 cohort.

The number of total students enrolled in this course has increased by more than 60% from the year 2019.

The overall proportion of grades seems to have closely similar pattern. However, in the year 2020 there were fewer students that sat for re-exam compared to the previous year.

After re-exam, all students enrolled have gotten passing course grades in 2020, including 1 re-registered student from previous year.

It is also worth mentioning that the written exams have had slightly different forms in the two years: in HT19 it was classroom administered written exam, while in HT20 we had zoom-monitored digital written exam using Canvas Quiz (in two parts), and oral exams for re-examination following the decision and recommendations KTH has established for the period.

6. Answers to open questions

The general view of the course is positive. It was deemed well organised, interesting and relevant content. A few reported that they needed to spend more effort to catch up with new concepts. The responses on all the LEQ statements scored between 5.4 and 6.3 on a 7 grade scale.

7. Summary of students' opinions

The student course evaluation has been run as live Menti.com anonymous quiz with the student representative running the questions. This way it was possible to achieve very high rate of response (100%).

The LEQ had a response rate of 71% (15 out of 21), much higher than the 23% the year before.

Overall, students have pinpointed several aspects as good aspects. Here are some excerpts from what was perceived as positive. Many of them are similar to comments from the previous cohort. Here are the key things the responses indicated as positive:

- *The structured approach was different and unique also much interesting to learn more.*
- *The chance to worked with real company data and got a good insight in the industry.*
- *The help and support from teachers was one of the best points in this course. The guidance given for the project work showed how we should think.*
- *The game seminars within circular economy, values and systems thinking along with the project task was great.*
- *The diverse course activities and learning through discussions and playful interactions.*
- *The collaboration with industry through guest lectures and the study visit really helped with connecting the theoretical concepts with the application in practice. Unfortunately due to Corona this was not possible to the extent as originally planned, but I would like to thank you for making this as good as possible under this situation.*

Things that could be improved considering students' evaluations include:

- *Suggested books can be given.*
- *A little more advice on the project, like where you want us to go.*

- *Maybe more practice on how to think critically can be given to students, as not everyone comes from the same background and have different skills. This helps them in their project work and also for answering exam questions.*
- *Lectures could be more structured with examples and slides could be made easier to follow.*
- *Have quiz at the end of every lecture for practice.*
- *Balance project workload with the number of group member (e.g. 3 instead of 5).*

8. Overall impression

The students generally seem to appreciate the course content and structure. It is apparent from their final comments and suggestion to next cohort of students that they suggest from the different learning moments for increasing experience.

9. Analysis

As mentioned before, comments from the previous year have been incorporated in this round of the course. This seems to have been well accepted by the students because they have pinpointed those improvements (e.g. coordinating among teachers in different courses, more structure to project work in the course etc.) as useful. The campus and zoom (online) session combination is perceived good given the pandemic situation and prevailing applicable health recommendations.

From a previous year comment there has been a suggestion to include life cycle analysis (LCA) content. While some class discussion has been held on the topic, further expansion on that could be considered for next time. Students have not commented in this though.

Below are a few comments from the suggestions students provided in the Mentimeter survey, which have not been mentioned in the LEQ.

- *It appears that several students felt that they have challenges to fulfil ILO5 (i.e. relating sustainability regarding supply chain and transport).*
 - Comment: this might be due time give for supply chain/logistics topics and we might need to consider additional lessons on that next year
- *Too few study visits*
 - Comment: given the covid-19 pandemic this was what we could. As situation improve we hope to get more industry study visits
- *Suggestion was given to have a bridge seminar for students with little background in core subject matter topics for students from other backgrounds*
 - Comment: this could be something to consider for a flipped classroom moment on introductory topics plus suggestion of reading material. The challenge is how to integrate this into course resource planning.
- *Introduce short quizzes at end of each week or after each lesson.*
 - Comment: this might need additional time planning but quite useful and beneficial to introduce next year.

- *There were other comments about making project definition more specific.*
 - Comment: perhaps what we need is rather to improve understanding of expectations to work starting from defining their own specific topics based on the loosely described scenarios in the project-PM.

10. Priority course development

The improvements made based on last year comments e.g. further clarification on project assignment, and moments to better address ILO4 seem to have been working well from the student reflections. For this round some of improvement areas for course development shall be:

- Introductory (flipped) activities for students from diverse backgrounds (based on pre-assessment being done)
- Further lessons on the production logistics/supply chain area
- Introducing quizzes as continuous assessment

11. Other information