

## **Course analysis for course ML2305 Production logistics and Supply chains**

**Period:** Period 2 2023.

**Course responsible:** Magnus Wiktorsson

**Examiner:** Magnus Wiktorsson

**Teachers in course:** Magnus Wiktorsson, Wajid Ali Khilji, Yongkuk Jeong, Tarun Kumar Agrawal (guest lecturer, Chalmers), Jan Olhager (Guest Lecturer, Lund University); Johan Wilhelmsson (Guest Lecturer, Väderstad AB) and Patrik Johansson (Guest Lecturer, Scania AB)

### **Examining moments:**

- PRO1 - Project work, 3.0 credits, Grading scale: A, B, C, D, E, FX, F
- TEN1 - Written exam, 3.0 credits, Grading scale: A, B, C, D, E, FX, F

### **1. Description of the course evaluation process**

The course was evaluated in two ways: (1) an online Mentimeter based evaluation was performed on the last day in course, (2) a LEQ was performed by the students. The Mentimeter evaluation was done just before the final presentation for PRO1, before the written exam (TEN), and the LEQ was conducted after the exam. Generally, the online Menti feedback worked very well and gave the opportunity of anonymous feedback from 83% of registered students (10/12) and 100% of the students actually taking the course (10/10). Only 2 students answered the LEQ, resulting in no report (too few responses).

### **2. Statement of meetings held with students**

A program council was held with student representatives at the end of P1 (Sept 27, 2023), discussing P2 courses in the master's programme, including ML2305. The course was also discussed with student representatives in program council beginning of P3, in January 24, 2024.

### **3. Course content**

#### **3.1 Intended learning outcomes**

After passing the course, the students should be able to:

- Define production logistics and supply chain management and categorise the different elements in a supply chain by applying an established framework.
- Describe, analyse and compare different transport systems and warehouse logistics systems, their components and underlying technologies for internal and external material flows.

- Explain how and under which requirements an increased digitisation and various IT systems can facilitate a transparent and seamless information flow in production logistics or in a supply chain.
- Identify and analyse interplay and information sharing in different parts of the production logistics, between different units in an organisation and between companies in a supply chain for physical products.
- Analyse the needs of a producing company, regarding its internal and external logistics systems from environmental, social and economical perspectives and set together possible solution proposals.

### 3.2 Examination and finalizing the course

- **Grading scale**

A, B, C, D, E, FX, F

- **Examination**

PRO1 - Project work, 3.0 credits, Grading scale: A, B, C, D, E, FX, F

TEN1 – Online exam, 3.0 credits, Grading scale: A, B, C, D, E, FX, F

	ILOS	PRO1 (3,0)	TEN1 (3,0)
ILO1	Define production logistics and supply chain management and categorise the different elements in a supply chain by applying an established framework.		X
ILO2	Describe, analyse and compare different transport systems and warehouse logistics systems, their components and underlying technologies for internal and external material flows.		X
ILO3	Explain how and under which requirements an increased digitization and various IT systems can facilitate a transparent and seamless information flow in production logistics or in a supply chain.		X
ILO4	Identify and analyse interplay and information sharing in different parts of the production logistics, between different units in an organization and between companies in a supply chain for physical products.	X	X
ILO5	Analyse the needs of a producing company, regarding its internal and external logistics systems from sustainability perspectives and set together possible solution proposals.	X	X

- **PRO1 – Projektarbete, 3.0, betygsskala: A, B, C, D, E, FX, F**

Group work, Case based. Continuous in the course. Written report and oral presentation.

*The purpose of the project is to understand, analyze and experimentally validate the functioning of various production logistics and supply chain technologies/systems. Students are provided with a topic (concerning one technology/system) and they have to conduct experiments in KTH/Scania Smart Factory Lab. During the experimentation, they have to identify and analyze interplay and information sharing in different parts of the production logistics, between different units in an organization and between companies in a supply chain for physical products. This task shall be performed in a group of 2-3 students. The students also present the finding through a report and oral presentation. In the report and presentation,*

students must also highlight the needs of a production company, regarding its internal and external logistics systems from sustainability perspectives and set together possible solution proposals. Detailed instructions will be available in CANVAS.

**Basic Criteria (BC):** Attendance at lab introduction, submission of assignment report and oral presentation of projects. Lab introduction is important and compulsory to attend as all the safety instructions will be explained during the session, which is mandatory before starting experiments in lab.

For **Fx** grade the **BC** should be fulfilled. Possibility of supplementation is provided by agreement.

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>
ILO4	<b>BC + In the light of a structured external analysis and in a scientific approach, present an identification and analysis</b> regarding collaboration and information sharing (between components or units) for a specific production logistical problem	Partly satisfying criterion for A	<b>BC + In the light of an external analysis, present an identification and analysis</b> regarding collaboration and information sharing (between components or units) for a specific production logistical problem.	Partly satisfying criterion for C	<b>BC + Present an identification and analysis</b> regarding collaboration and information sharing (between components or units) for a specific production logistical problem
ILO5	<b>BC + In the light of a structured external analysis and in a scientific approach, present an analysis</b> of a company's needs with regard to sustainability perspectives and compile possible solutions that can help solve the company's problems in production logistics.	Partly satisfying criterion for A	<b>BC + In the light of an external analysis, present an analysis</b> of a company's needs with regard to sustainability perspectives and compile possible solutions that can help solve the company's problems in production logistics.	Partly satisfying criterion for C	<b>BC + Present an analysis</b> of a company's needs with regard to sustainability perspectives and compile possible solutions that can help solve the company's problems in production logistics.

- **TEN1 – Online Exam, 3.0, betygsskala: A, B, C, D, E, FX, F**

The purpose of the online exam is to evaluate the understanding and knowledge of the students related to the ILOs 1 to 4. Online exam will be a mix subjective and objective questions, including case studies and situation based reasoning questions. The mode of response during the exam would be written, oral or mixed. Detailed instructions will be available in CANVAS.

- **Final Grades:**

- For a passing grade in the course, the student has to pass (at least score E) in TEN1 and PRO1.
- The Final grade is set according to following table with the two grades.

PRO1 (3hp)	TEN1 (3hp)				
	A	B	C	D	E
A	<b>A</b>	<b>B</b>	<b>B</b>	<b>C</b>	<b>D</b>
B	<b>A</b>	<b>B</b>	<b>C</b>	<b>C</b>	<b>D</b>
C	<b>B</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>D</b>
D	<b>B</b>	<b>C</b>	<b>C</b>	<b>D</b>	<b>E</b>
E	<b>C</b>	<b>C</b>	<b>D</b>	<b>D</b>	<b>E</b>

#### 4. Students' work effort time in relation to points

The extent of students work are estimated to correspond to the course's points (40 hours / 1.5 credits). This is also verified by the statements in the course evaluations, indicating a work load of some 20-23 hours a week.

The students' split of opinions on the course workload a scale "very relaxed – somewhat relaxed – somewhat stressful – very stressful" was 0 / 9 / 1 / 0. This was a change from last year (2022: 9 of 15 stating "somewhat stressful"). The split of opinions on scale "Easy – Challenging – Difficult – Too difficult" was 3 / 5 / 2 / 0. This was not so different from last year (13 of 15 stating "Challenging").

#### 5. Students' results

2023. Total 12 registered students. 10 active.

	A	B	C	D	E	F	Did not take exam
<b>PRO1</b>	2	4	3	0	0	0	3
<b>TEN1</b>	1	4	3	1	0	0	3
<b>Final</b>	1	4	3	1	0	0	3

2022. Total 18 registered students. 14 active.

	A	B	C	D	E	F	Did not take exam
<b>PRO1</b>	2	7	5	0	0	0	4
<b>TEN1</b>	5	5	1	1	2	0	4
<b>Final</b>	4	7	1	2	0	0	4

2021. Total 10 students

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>Did not take exam</b>
<b>PRO1</b>	4	6	0	0	0	0	0
<b>TEN1</b>	4	2	3	1	0	0	0
<b>Final</b>	4	4	2	0	0	0	0

2020 - Total 23 students

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>Did not take exam</b>
<b>PRO1</b>	9	0	2	9	3	0	0
<b>TEN1</b>	3	6	6	5	2	0	1
<b>Final</b>	3	5	7	5	2	0	1

2019 - Total 13 students

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>Did not take exam</b>
<b>PRO1</b>	6	2	2	3	0	0	0
<b>TEN1</b>	5	3	1	1	1	1	1
<b>Final</b>	4	5	0	2	0	0	2

This course ran for the fifth time and the average scores of the students were similar to previous years. The results are generally good with highly engaged students in lectures and project work.

## **6. Answers to open questions**

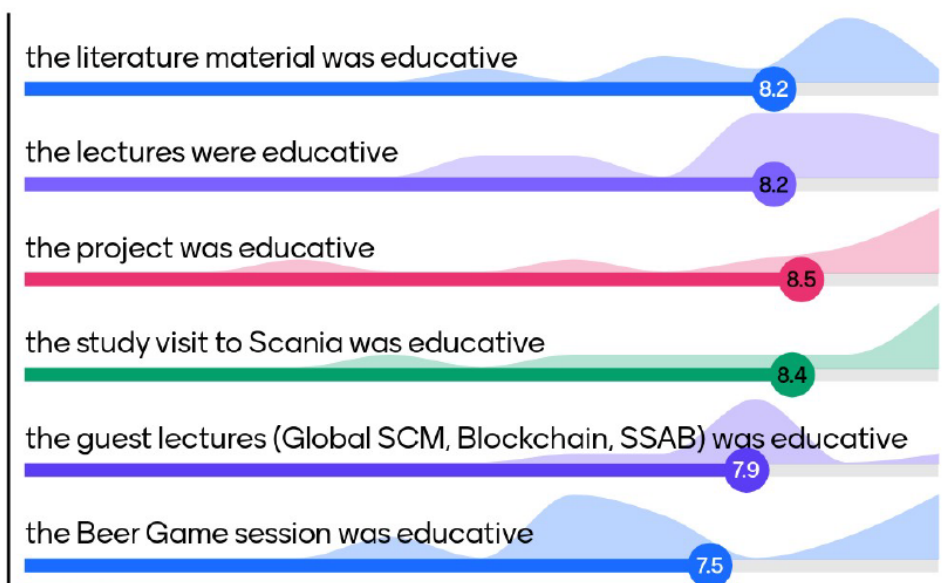
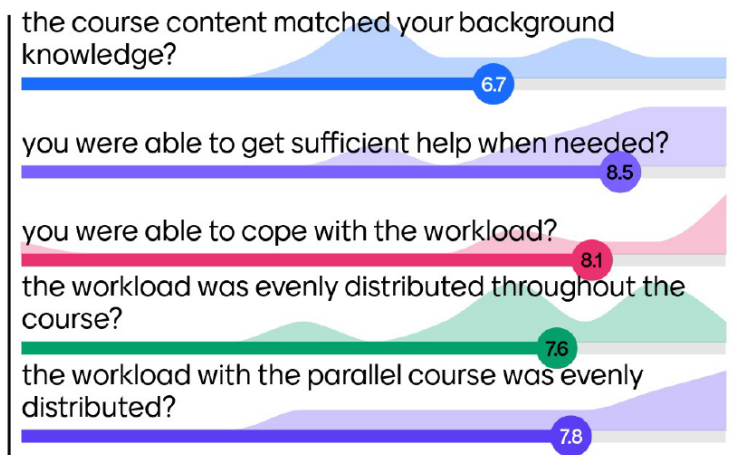
The general view of the course is positive. The students especially liked the guest lectures, the project work, visit to Scania control tower and some of the topics covered during the lectures.

Improvements were suggested on even more precise guest lectures and lecture contents and even more practical study visits (want to see industrial environment).

## **7. Summary of students' opinions**

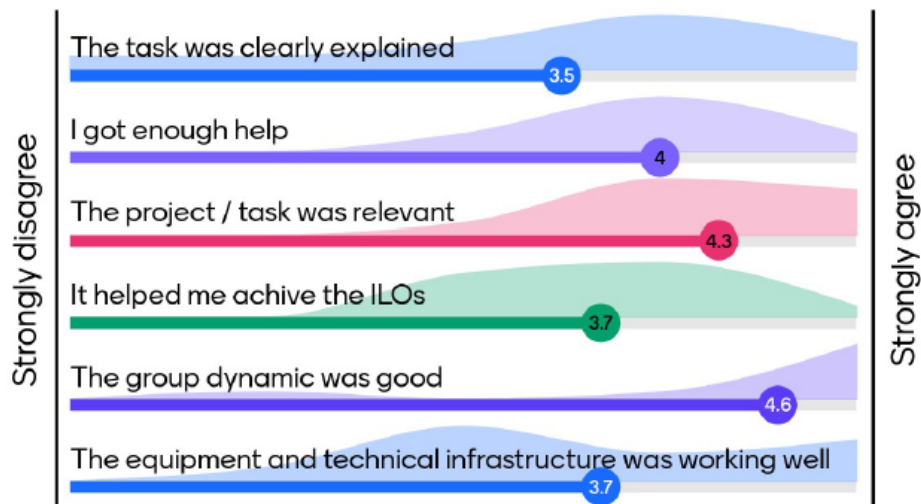
The student course evaluation has been run as live Menti.com anonymous quiz with the course responsible running the questions. This way it was possible to achieve very high rate of response, with 100% of active students responding (83% of all registered).

The responses on the general opinion questions in Menti were distributed on a scale 1 – 10 as below.



Overall, these are the key things the responses indicated as positive:

- The students found the guest lectures from LU (Global SCM), Chalmers (Blockchain), Väderstad and Scania interesting. Specially the industrial visit to Scania Control tower. It helped them to connect theory with practice. But some improvements also suggested (section 6)
- In terms of amount of the activities, guest lecture was mostly regarded as just right, also the regular lectures were regarded generally as in the right amount. Distribution: Too many (1), The right amount (8) and Too few (1).
- Regarding project work, the students liked it very much. They found them interesting and the experiments helped them to understand the practical applications of technologies. The evaluation on the project was as below:



Things that could be improved considering students' evaluations include:

- Some students wanted better explanation of the project tasks, more teacher guidance. One commented that the groups should have been formed by teacher.
- The Beer Game exercise did not get the best of evaluation.
- Lectures could be more specifically targeted to the Learning Objectives. Some also wanted more technical depth in lectures.

## 8. Overall impression

The course is maturing in content as well as form. It covers a wide set of areas as well as various learning and examination forms. The project work was conducted at KTH Södertälje Logistics lab as well as Scania Smart Factory lab.

Since last year we have made more clear project descriptions, adjusted some lectures, introduced three online open Canvas quizzes for students to take whenever they want during the course (not part of examination). The final examination was also adjusted in terms of slightly adjusted forms of questions. No comments have been given on the final examination.

## 9. Analysis

Some key issues of consideration for future development include the following:

- Generally, the students felt satisfied and expressed a good learning experience. The changes in terms of more exact project description, continuous quizzes and adjusted final examination was deemed positive.
- The students found fulfilment of ILO1, ILO2, ILO3, ILO 5 well covered. However, ILO4 was considered slightly less fulfilled (*Identify and analyse interplay and information sharing in different parts of the production logistics, between different units in an organization and between companies in a supply chain for physical products*). So far has this proficiency mainly been credited via the project work. However, the project focus a specific production logistics technology and not an organisational setting. This wider scope need to be further strengthened.

- For next year the course need a redesign in terms of form. It will be included, not only in the TITHM program in Södertälje, but also in the TPRMM program in Stockholm. We will need to give lectures and project work available for both Södertälje and Stockholm. The number of students will also radically increase from 10-15 at one campus to some 40-60 at two campuses.
- Specific changes for next year include offer lectures as hybrid format (both Södertälje and Stockholm), to redefine project tasks so it is feasible to run 40-60 students in hands-on project assignments. We need to enlarge group sizes, make multiple sessions and multiple experimental settings. The examination format will also need to be adjusted to cope with the larger amount of students. The hand-in project report need to be clarified in terms of allowed support (AI). The written examination need slight adjustment in questions so the correction is feasible given the large amount of students. The industry visit provide high value to the course but may be slightly adjusted to fit even better. The visit to Scania may need adjustment given the large amount of students.

## **10. Priority course development**

Following aspects of the course should be developed in the first place:

- Define hybrid lecture possibility, to enable students at two campuses.
- Review how students should be able to fulfil ILO4 in an even better way.
- The Beer Game could be reconsidered, if it should be included or not.
- Include lab possibility in KTH Stockholm, in addition to KTH Södertälje and Scania Smart Factory Lab. Possibly also at other company setting. Ensure availability at Scania.
- Organise study visit to fit the larger number of students. Study visits to other logistic application sites, apart from Scania, could be considered.
- Clarify use of AI tools in project report writing.
- Adjust examination to fit larger number of students.

## **11. Other information**