

## Analysis of Circular Manufacturing Systems (code MG2043, 6 ECTS)

HT22

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

This course evaluation is conducted based on the input received from the students through course evaluation surveys and based on the experiences of the course responsible/teacher gathered during running the course.

### 2. Description of meetings with students

No meeting with students on course evaluation surveys was conducted in HT222.

### 3. Course design

This is a 6 ECTS course designed to introduce the fundamentals of circular economy as well as the concept of circular manufacturing systems (CMS) and the framework for its implementation. This is a project-based course where students implement the knowledge to complete the project. Through the project, the course also stimulates the students to work with practical problems that will contribute to sustainable development as well as encourages them to bring forward solutions that have entrepreneurial value. The project work is equivalent to 4 ECTS and determines the grade in the course.

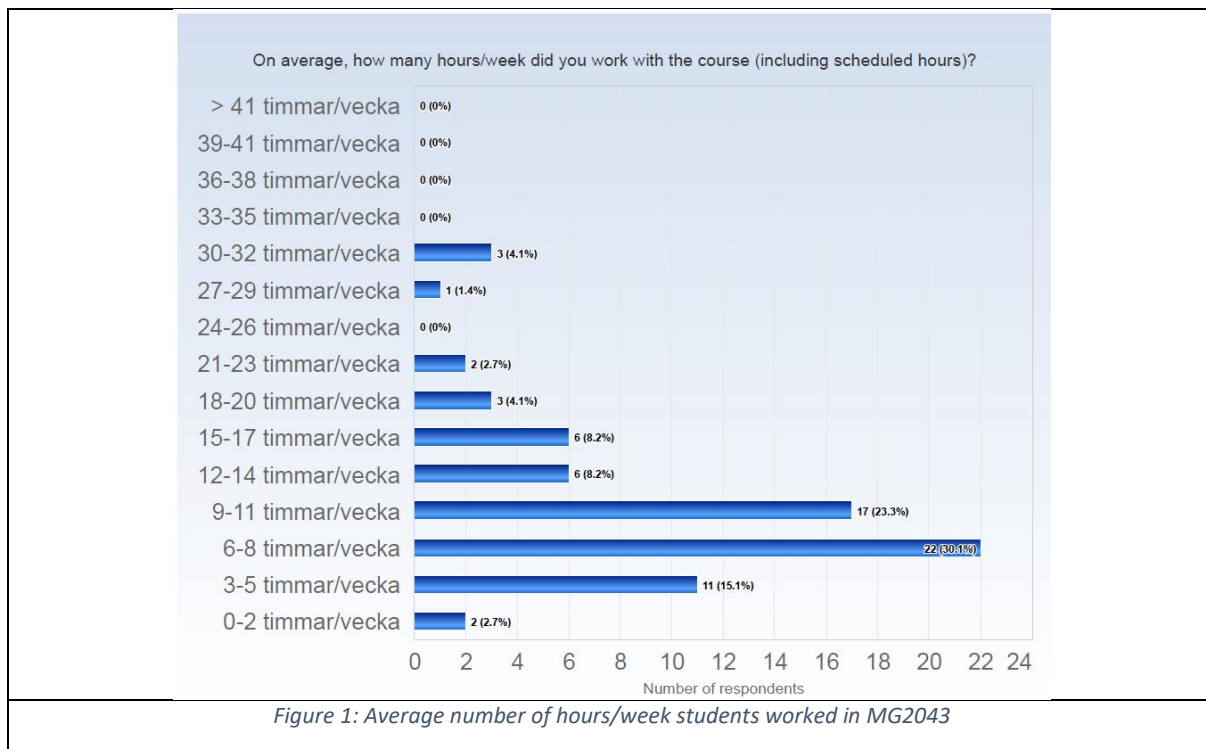
There is a quiz on the reading materials equivalent to 1.5 ECTS to ensure that the students have gone through the important literature on the topic.

Most of the lectures in the course are followed by a seminar for deep-diving into the topic and allow students to apply the theory (from the lectures) in their project work in addition to the final seminar. To stimulate discussion and engagement, active participation in the seminars gives 0.5 ECTS.

### Students' workload

As Figure 1 shows, the majority of the students, i.e. about 53.5 % of the students spent 6 to 11 hours every week in the course corresponding to 48 - 88 hours against the expected 160 hours (a 6 ECTS course, spread over 8 weeks). About 18 % of the students spent less than 5 hours every week corresponding to less than 40 hours. About 16% of the students spent up to 17 hours every week corresponding to about 136 hours in total. This time variation is due to the fact that the course is based on project work where students decide the level of ambition and effort they want to put in the project work. This reflects rather proportionally on the grade as shown in Figure 2. It could be concluded that the student group that spent the highest time received a grade A whereas the student groups that spent moderate to low time received grades 'B' and 'C'.

Despite this variation, most of the students (who left comments) experienced that the workload in this course is relatively higher than other 6ECTS courses that they have taken at KTH.



### Students' results on the course

The grade distributions of the course in HT 22 are shown below. The ratio of grade 'A' may be perceived as relatively high. Since this is a project-based course (where the grade is based on project work, report and the final presentation), the students get formative feedback during the process and can improve their work continuously before the final grade is decided. Thus, the high ratio of grade 'A' is justified.

Grade	Count	%
A	47	50%
B	18	19%
C	19	20%
D	0	0%
E	0	0%
F	10	11%
	<b>94</b>	<b>100%</b>

Figure 2: Results of MG2043 in HT22

## Students' answers to open questions

Since the course had a large number of participants the amount of comments left by the students are rather large. Some of the comments are redundant and repeating. Some of the relevant comments are listed below by categorizing them as positive and critical comments.

### Positive comments:

*"That we used our creativity on the assignment and did not just follow some strict rules or instructions. We had the opportunity to work with any subject that we wanted as long as it was aligned with the course."*

*"The topics covered are modern and thought-provoking"*

*"That I have learned to think differently from the business plan to being withdrawn and not always being the one leading the group."*

*"The project that allowed us to go deep into the subject and really see the importance of cms."*

*"I really like that we started with an ice breaking activity, it was really fun."*

*"The tutors in this course have a lot of knowledge and I feel like that is very inspiring. The reading material was great and the lectures supported the reading material well. All in all I think this was one of the most interesting courses I've taken."*

*"Able to learn different ideas from other students."*

*"The best aspect was that everyone had the freedom to try and implement their ideas because many in the group were from different backgrounds in terms of the discipline which they are pursuing.."*

*"The group project was stressful but good fun."*

*"The openness of the course - the possibility to ACTUALLY do whatever we felt we wanted to while learning! A really cool concept that should be implemented more. We could take this course to any level we wanted. And now we feel inspired to go forward with the business - Great!"*

*"Finally a framework for HOW to become circular. There are so many "sustainable" courses that are based on theory, without actually touching upon the important issues. This was NOT one of them. It had a clear structure, and a clear framework that was easy to understand and follow during the time of the project"*

*"The division of the course into simple topics"*

### Critical comments:

*"The initial quiz is too early"*

*"I don't understand why we have to read all the literature alone in the first two weeks of the course. All subsequent lessons are just a repetition. It would make more sense to go through the topics together with the professors and then take the exam at the end of the course."*

*"The lectures were repetitive, which is why I ended up not going to them. I would have preferred more seminars to discuss in groups certain topics from the reading material. For me, talking about the subject is the best way to learn."*

*"course size"*

*"Timespan between feedback and submission"*

*"Have more deadlines and drafts to have more feedbacks on our project. Also the quiz on the readings was a lot of work due to the large amount of articles, which didn't seem as useful and was mostly already said in class."*

### Summary of students' opinions

As seen in the comments above, the course got both positive remarks and some critical remarks. The relevant critical remarks are neither unusual for a course of this size nor difficult to address in the next round of the course.

### Overall impression:

*The polar diagram in*

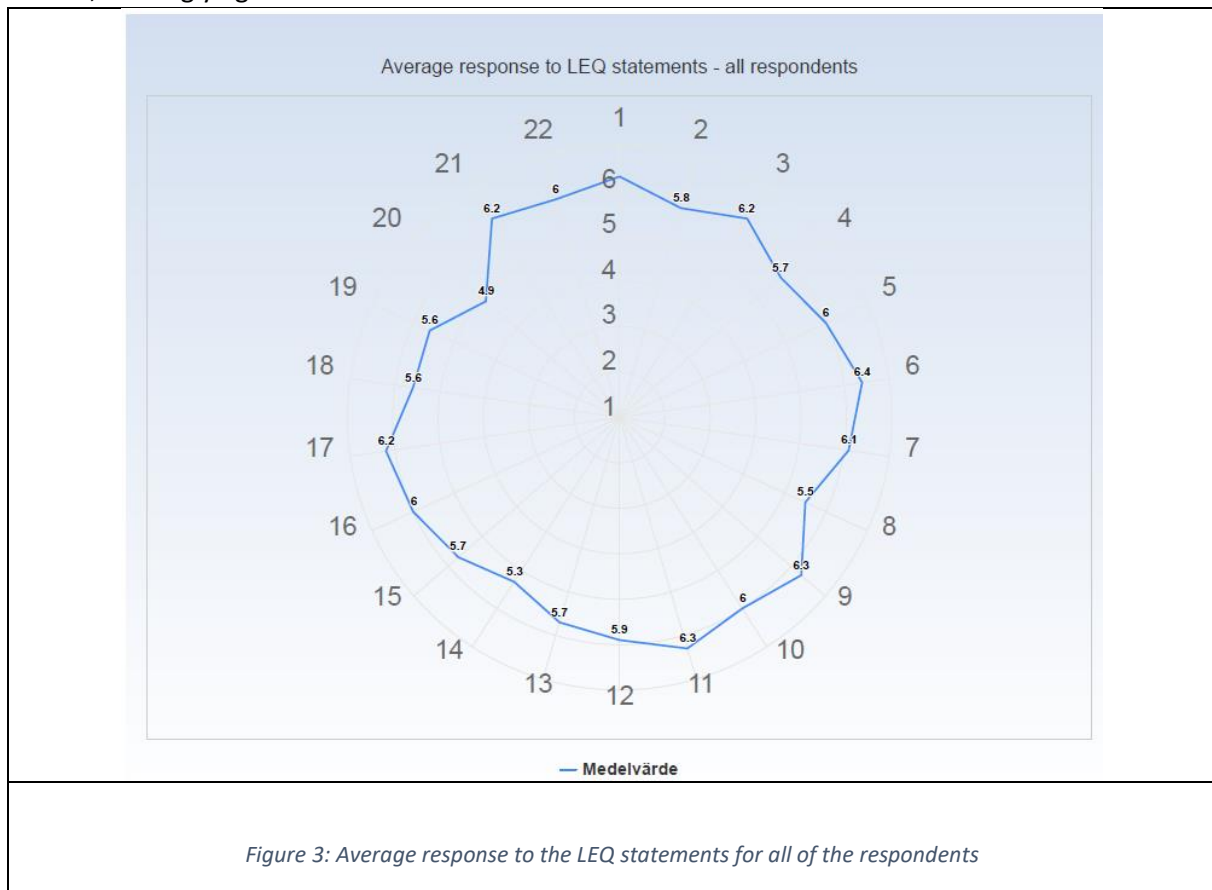
Figure 3 below shows the average response to the LEQ statements for all of the respondents (only valid responses are included).

The scale that is used in the diagrams is defined by:

1 = No, I strongly disagree with the statement

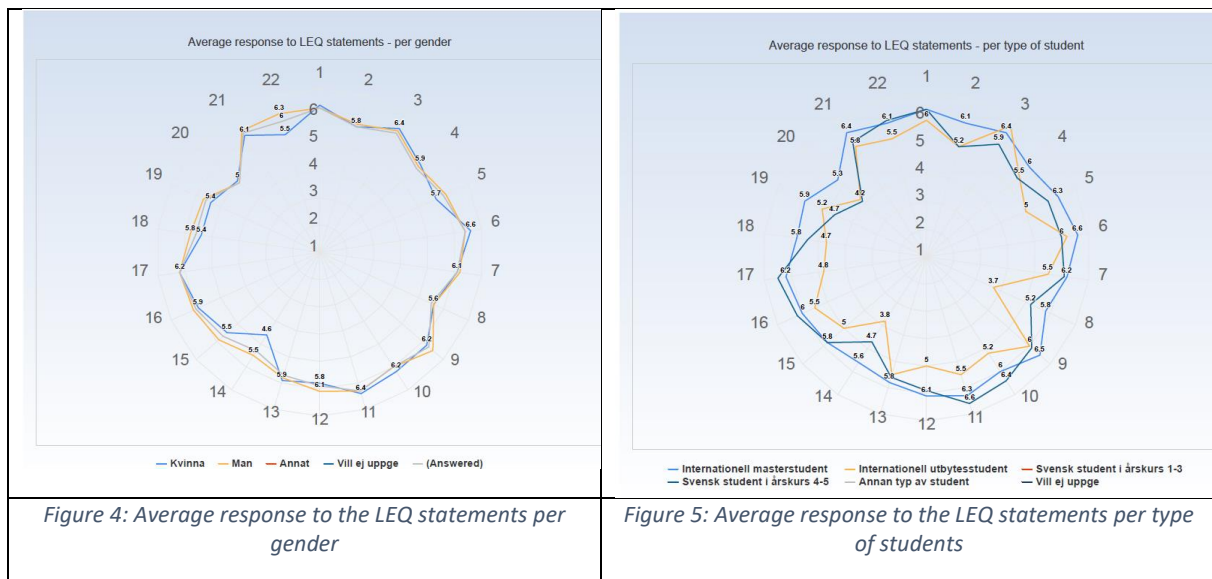
4 = I am neutral to the statement

7 = Yes, I strongly agree with the statement



*Figure 3: Average response to the LEQ statements for all of the respondents*

The average score to LEQ statements in the polar diagram below 6 is considered as the potential area of improvement and below 5.6 as critical. Unlike HT21, there is a minor variation in response to the LEQ statements from the perspectives of gender as shown in figure Figure 4. However, there is a major variation in response to the LEQ statements from the perspectives of the type of students as shown in Figure 5. As it seems, the international students are generally positive, whereas the exchange students are rather critical on several LEQ statements such as statements 8, 14 and 20. This variation could be an interesting topic for further investigate.



### Analysis:

Based on the input from students both through the survey and the discussion and my own experience it is safe to say that students perceive the course as a good course. The course contents cover important aspects of CMS and the course activities are well-aligned to meet all ILOs. LEQ statements 8, 14, and 20 (score between 4.9 and 5.5) deal with organizations of the course to support learning, getting feedback on progress and opportunities to influence the course activities which got lower scores.

20% of the student felt the that course was organized in a way that supported their learning. The main complaint summarises as that the contents of the articles are repeating in the lectures as the student stated, *“The papers and the lessons where repetitive. The tentan was before the last lesson so in that way the lessons after that felt a bit unnecessary because we already had to dig deeper into that topic.”* As a teacher, I find this statement positive which shows that the student has read all the articles thoroughly and attended all lectures and seminars. This also shows that the student has understood the concepts. Furthermore, the repetition of core concepts reinforces learning.

26% of the students felt that they did not get enough feedback from the teachers despite introducing two supervision sessions for each project group. They also felt 15-minute meetings were too short. Nevertheless, the students were asked to book supervision meetings whenever they felt necessary beyond these two supervision sessions. Since this option was open to all and the students didn’t take the initiative to get the feedback, I find ‘lack of feedback’ is an invalid point.

38% of the students felt that they did not have the opportunities to influence the course activities. The course activities are not designed to be influenced by the students. However, they had plenty of opportunities to influence the way they learned.

### Prioritized course development:

Based on the input and analyses made above, the following activities are prioritized for course development for the next intake:

1. Clarify further that the students can get supervision and feedback beyond the two supervision sessions that are scheduled.
2. Move the quiz further ahead in the course.

3. Investigate further why responses differ among international M.Sc and exchange students