

Report - EL2520 - 2023-09-11

Respondents: 1
Answer Count: 1
Answer Frequency: 100.00%

Please note that there is only one respondent to this form: the person that performs the course analysis.

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

Elling W. Jacobsen, jacobsen@kth.se

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 evaluation was mainly carried out with an online survey. Invitation to the survey was sent out after the final exam, with repeated invitations to those who did not take the survey.

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.)

Meetings with students mainly took place in the lecture hall. Feedback from the students were invited and also received both during lectures, in breaks and through discussion groups on the course homepage in Canvas.

COURSE DESIGN

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

The course consists of 14 lectures, 10 exercises, 4 computer lab assignments in groups of 2 students with hand-in, and one lab project in groups of 4 with hand-in. The grade is based on a final written 5h exam.

THE STUDENTS' WORKLOAD

Does the students' workload correspond to the expected level (40 hours/1.5 credits)? If there is a significant deviation from the expected, what can be the reason?

The students report a workload of between 15 and 20 hours per week, which seems reasonable given that the course is 7.5 credits. A few students report 25-29 hours per week and it is not clear what the reason is.

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 students performed very well this year, both on the labs and the final written exam. About 30% received grade A or B, which is considered very satisfactory. Also, few students failed the exam. All over a much better result compared to last year. Last year we attempted to run the classes in the form of flipped classroom, but the students did not really seemed prepared for this and in the end very few students participated in the meetings. This year we went back to traditional lecturing.

STUDENTS' ANSWERS TO OPEN QUESTIONS

What does students say in response to the open questions?

Overall the students seem to be very happy with the course content and the teaching. Many students highlight the labs and the availability of lecture notes and videos of lectures and exercises.

SUMMARY OF STUDENTS' OPINIONS

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

Most students seem satisfied with the course, albeit many find the material covered challenging.

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.

During Covid the course was mainly given over Zoom. When we went back to on campus teaching last year, we decided to try flipped classroom for both lectures and exercises. However, while this worked very well for the first few lectures, the students started early to come unprepared to the meetings and the whole idea of flipped classroom then fell to the ground. In order for flipped classroom to work properly I think there has to be a change in the way students work, and this is something that has to be initiated from the first year they come to KTH. My impression is that the students I currently teach have adopted a working habit that does not fit well with the idea of flipped classroom, i.e., coming prepared to classes. Going back to traditional lecturing this year work much better in my impression.

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?

Too few answers on survey to draw any conclusions.

PRIORITIZED COURSE DEVELOPMENT

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

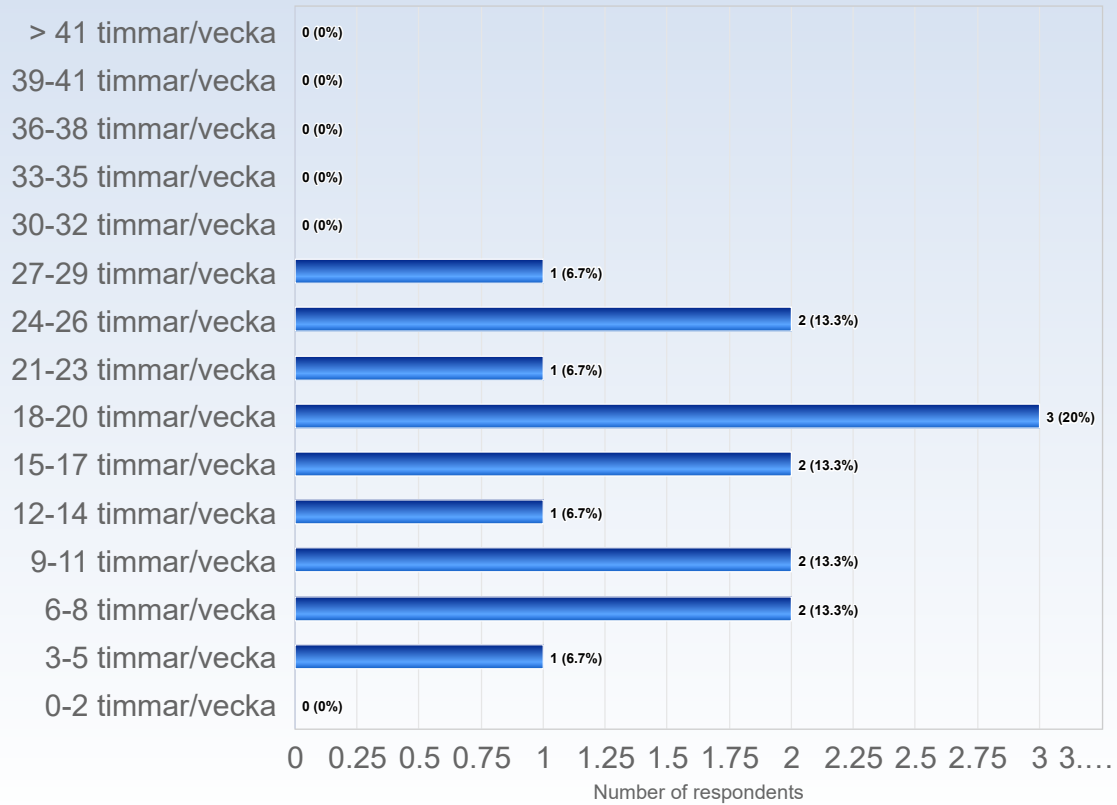
We will consider improving the computer labs and real life labs to as to make them more efficient in the context of continuous examination.

EL2520 - 2023-05-30

Antal responder: 97
Antal svar: 15
Svarsfrekvens: 15,46 %

ESTIMATED WORKLOAD

On average, how many hours/week did you work with the course (including scheduled hours)?



Comments

Comments (I worked: 9-11 timmar/vecka)

The number is probably little as I only included scheduled hours and some extra hours for the labs. I had difficulties to spend time on extra work for the exam due to the labs but mostly due to other courses.

Comments (I worked: 15-17 timmar/vecka)

It's nice to have access to lecture notes and videos. However in my case i had to kinda go through both of them because i didnt always understand the notes and had to go through the videos and see if they explained it better. Unsure if this is how its supposed to be but its a bit annoying having to switch back and forth but in the end the understanding is a lot better. All in all, good material but quite a lot to go through and time consuming if you dont understand it quickly.

Comments (I worked: 18-20 timmar/vecka)

personally, each lecture contains a lot of content and sometimes it was hard for me to follow the professor

It's a hard course which required a lot of time, i spent my time doing the exercise from the provided exercise sheet.

The solutions on the exercise sheet could be a more thorough, it was quite hard to understand.

Comments (I worked: 24-26 timmar/vecka)

Reasonable workload, definitely takes a bit more time than average for a student who is originally from mechanical engineering, since we lack certain prior knowledge and intuition that can be helpful. Still reasonable though!

Comments (I worked: 27-29 timmar/vecka)

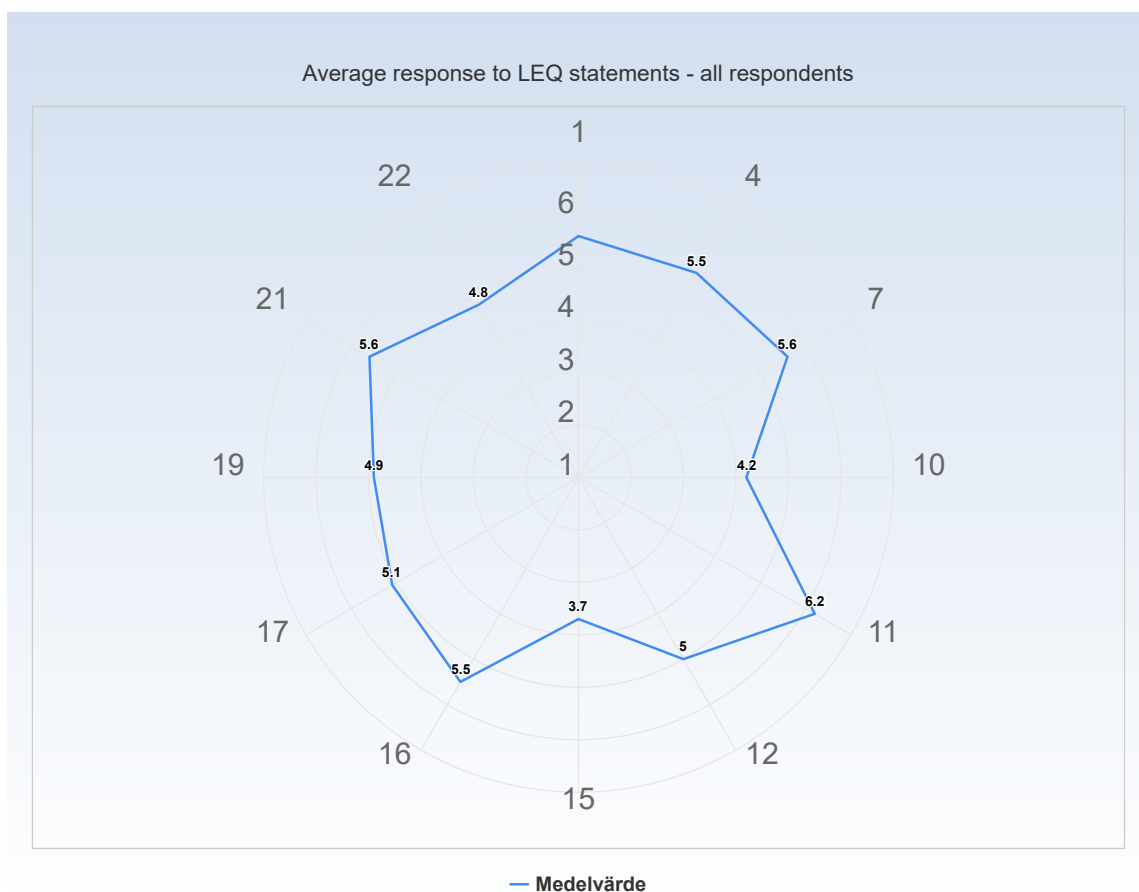
It depends on how you wanna approach the course, if you want to understand more you can spend more time on it

LEARNING EXPERIENCE

The polar diagrams below show the average response to the LEQ statements for different groups of 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

Note! A group has to include at least 3 respondents in order to appear in a diagram.



KTH Learning Experience Questionnaire v3.1.4

Meaningfulness - emotional level

Stimulating tasks

1. I worked with interesting issues (a)

Exploration and own experience

2. I explored parts of the subject on my own (a)
3. I was able to learn by trying out my own ideas (b)

Challenge

4. The course was challenging in a stimulating way (c)

Belonging

5. I felt togetherness with others on the course (d)
6. The atmosphere on the course was open and inclusive (d)

Comprehensibility - cognitive level

Clear goals and organization

7. The intended learning outcomes helped me to understand what I was expected to achieve (e)
8. The course was organized in a way that supported my learning (e)

Understanding of subject matter

- 9. I understood what the teachers were talking about (f)
- 10. I was able to learn from concrete examples that I could relate to (g)
- 11. Understanding of key concepts had high priority (h)

Constructive alignment

- 12. The course activities helped me to achieve the intended learning outcomes efficiently (i)
- 13. I understood what I was expected to learn in order to obtain a certain grade (i)

Feedback and security

- 14. I received regular feedback that helped me to see my progress (j)
- 15. I could practice and receive feedback without being graded (j)
- 16. The assessment on the course was fair and honest (k)

Manageability - instrumental level

Sufficient background knowledge

- 17. My background knowledge was sufficient to follow the course (f)

Time to reflect

- 18. I regularly spent time to reflect on what I learned (l)

Variation and participation

- 19. The course activities enabled me to learn in different ways (m)
- 20. I had opportunities to influence the course activities (m)

Collaboration

- 21. I was able to learn by collaborating and discussing with others (n)

Support

22. I was able to get support if I needed it (c)

Learning factors from the literature that LEQ intends to examine

We tend to learn most effectively (in ways that make a sustained, substantial, and positive influence on the way we think, reflect, act or feel) when:

a) We are trying to answer questions, solve problems or acquire skills that we find interesting, exciting or important

b) We are able to speculate, test ideas (intellectually or practically) and learn from experience, even before we know much about the subject

c) We are able to do so in a challenging and at the same time supportive environment

d) We feel that we are part of a community and believe that other people have confidence in our ability to learn

e) We understand the meaning of the intended learning outcomes, how the environment is organized, and what is expected of us

f) We have adequate prior knowledge to deal with the current learning situation

g) We are able to learn inductively by moving from concrete examples and experiences to general principles, rather than the reverse

h) We are challenged to develop a true understanding of key concepts and gradually create a coherent whole from the content

i) We believe that the work we are expected to do will help us to achieve the intended learning outcomes

j) We are able to try, fail, and receive feedback before, and separate from, each summative assessment of our efforts

k) We believe that our work will be considered in an honest and fair way

l) We have sufficient time for learning and devote the time needed to do so

m) We believe that we have control over our own learning, and not that we are being manipulated

n) We are able to collaborate with other learners struggling with the same problems

Literature

Bain, K. (2004). *What the Best College Teachers Do*, Chapter 5, pp. 98-134. Cambridge: Harvard University Press.

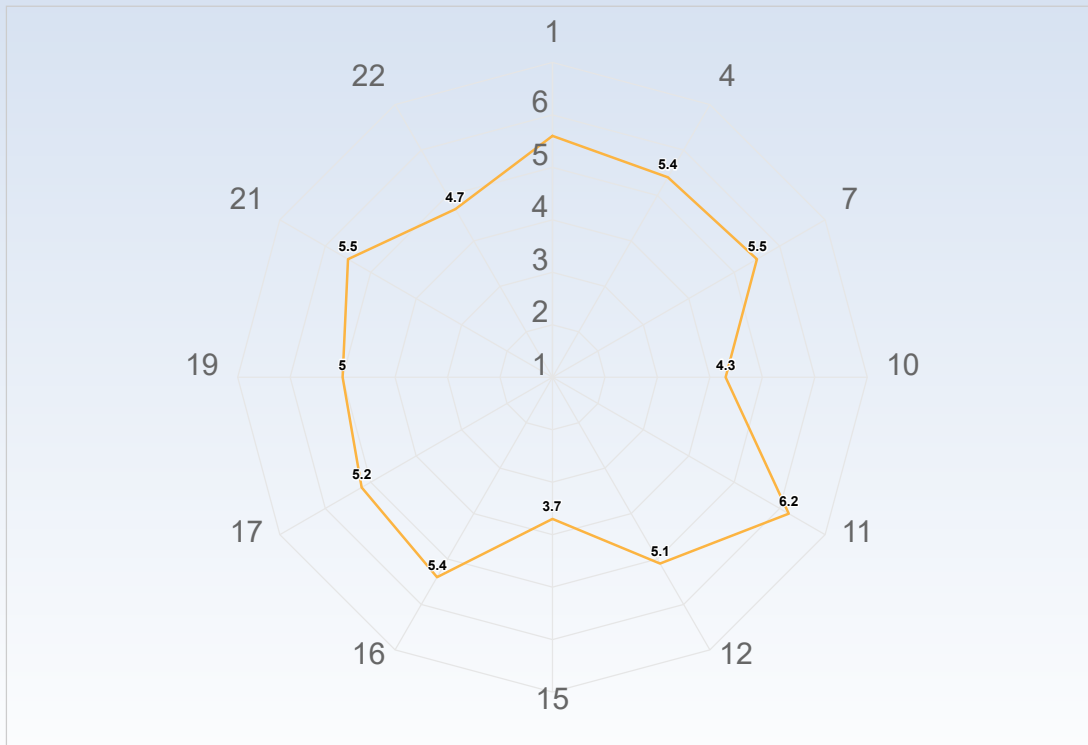
Biggs J. & Tang, C. (2011). *Teaching for Quality Learning at University*, Chapter 6, pp. 95-110. Maidenhead: McGraw Hill.

Elmgren, M. & Henriksson, A-S. (2014). *Academic Teaching*, Chapter 3, pp. 57-72. Lund: Studentlitteratur.

Kember, K. & McNaught, C. (2007). *Enhancing University Teaching: Lessons from Research into Award-Winning Teachers*, Chapter 5, pp. 31-40. Abingdon: Routledge.

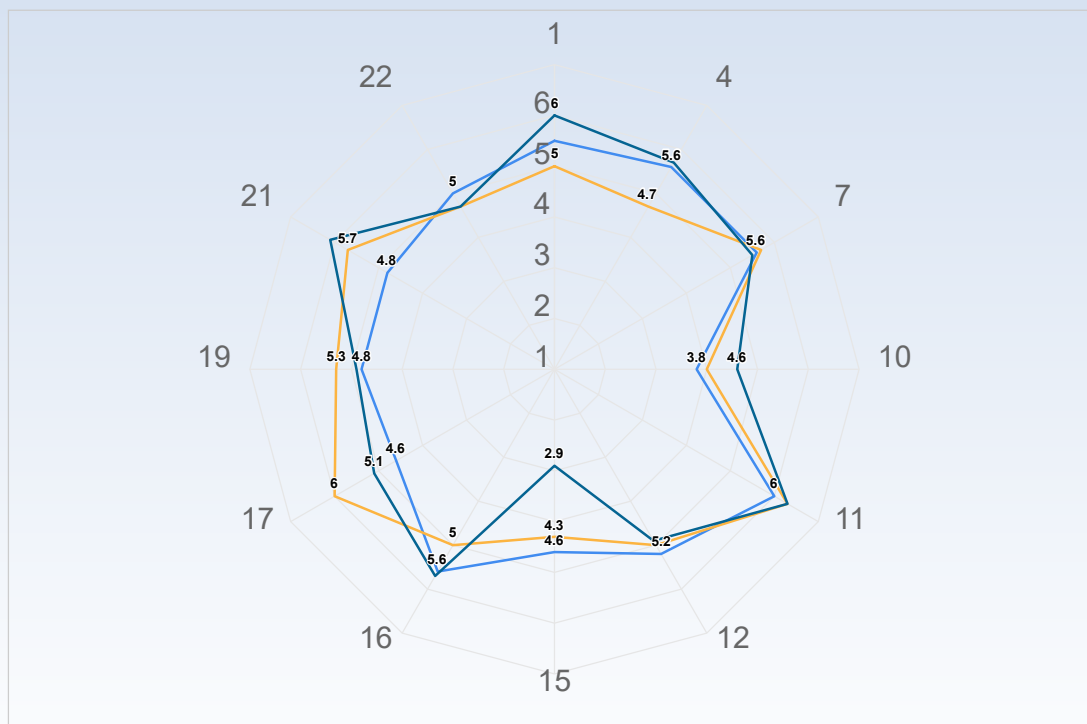
Ramsden, P. (2003). *Learning to Teach in Higher Education*, Chapter 6, pp. 84-105. New York: RoutledgeFalmer.

Average response to LEQ statements - per gender



— Kvinna — Man — Annat — Vill ej uppge

Average response to LEQ statements - per type of student



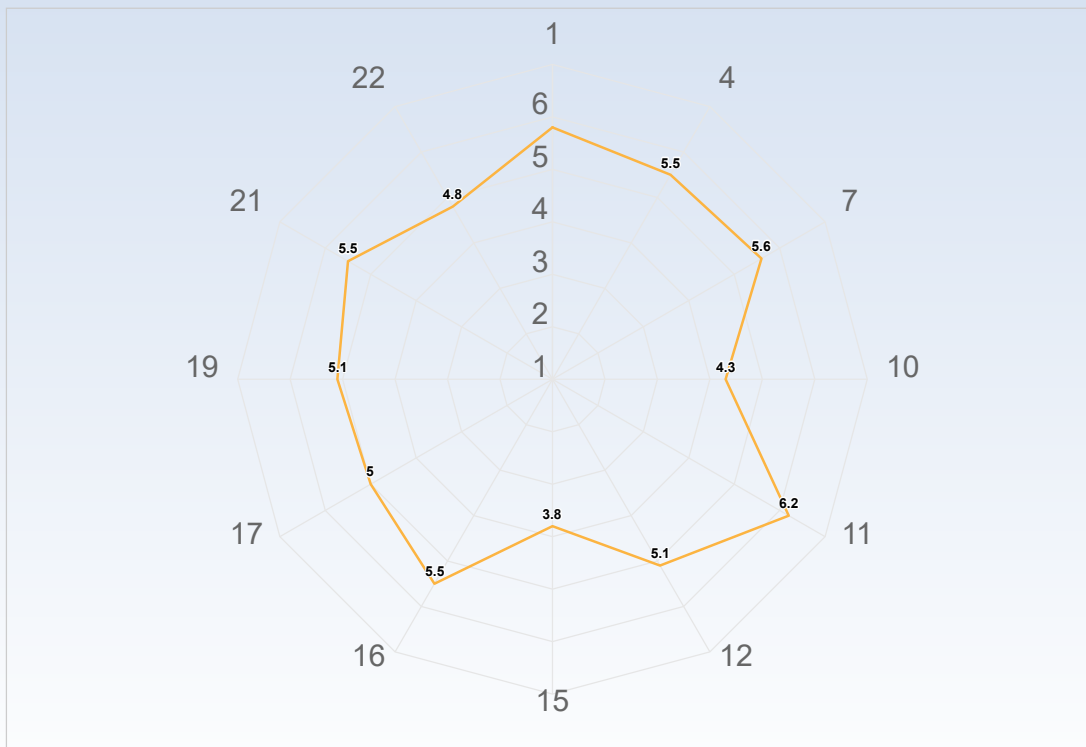
— Internationell masterstudent
 — Internationell utbytesstudent
 — Svensk student i årskurs 1-3
— Svensk student i årskurs 4-5
 — Annan typ av student
 — Vill ej uppge

Comments

Comments (I am: Svensk student i årskurs 4-5)

Currently doing the mechatronics master so we've done some more control theory perhaps but i still felt a bit lost at times.

Average response to LEQ statements - per disability



— Ja — Nej — Vill ej uppge

GENERAL QUESTIONS

What was the best aspect of the course?

What was the best aspect of the course? (I worked: 6-8 timmar/vecka)

I enjoyed learning about the different types of controllers, especially LQG and MPC.

What was the best aspect of the course? (I worked: 9-11 timmar/vecka)

The labs, lecture notes and having recorded material available even though the recorded exercises were not good.

What was the best aspect of the course? (I worked: 15-17 timmar/vecka)

It is quite interesting but can be quite time consuming and stressful if you dont understand things quickly. A few more examples of certain things might have been needed. I still dont quite understand how to interpret white noise and such still.

Lecture notes combined with the videos are nice!

What was the best aspect of the course? (I worked: 18-20 timmar/vecka)

Lab was the best aspect as we were able to connect what we were learning to physical system but a bit of help in lab would be helpful almost all contents for each lecture are related, which constructs a complete frame to help me get a better understanding

The labs (apart from the water tank): they were very informative, the lab information in the given documents were wholesome and sufficient to do and pass the lab.

What was the best aspect of the course? (I worked: 21-23 timmar/vecka)

The availability of recorded videos AND written lecture notes AND live lectures. It made it possible to take the course in a flexible way in case of scheduling conflicts or just re-structuring workload, as well as recapping the earlier lectures

What was the best aspect of the course? (I worked: 24-26 timmar/vecka)

The computer labs were a lot of fun.

What was the best aspect of the course? (I worked: 27-29 timmar/vecka)

There is a video on the lecture and the exercise. The material is really hard so the video really helps to repeat what the lecturer has explained in the class

What would you suggest to improve?

What would you suggest to improve? (I worked: 6-8 timmar/vecka)

Review the course syllabus and make changes accordingly
Add in examples when introducing the concepts

The many mistakes in past exam and exercise solutions make it hard to practice. Exercise solutions could use more details to facilitate learning.

Bandwidth and crossover frequency should not be used interchangeably.

Since this course deals with a lot of MIMO and SISO systems, more care should be taken in multiplication order to avoid confusion. More consistency in the definitions, taking into account multiplication order would have been helpful in generalizing concepts between MIMO and SISO systems.

Water tank was very finicky and the response is slow leading to lots of waiting. The sharing of lab equipment meant that previous measurements would likely have been changed by other groups leading to many failures. More rapidly responding systems would have been nice, e.g. cart pole, acrobot, etc.

The nuance between the different sensitivity functions (input sensitivity, output sensitivity, input complementary sensitivity, output complementary sensitivity) should have been explained in greater detail

I wish the course could periodically return to time domain to provide more intuition and illustrate certain ideas through both frequency and time.

What would you suggest to improve? (I worked: 9-11 timmar/vecka)

Better pedagogical approach on how to teach the solution on the exercises. You cannot present the solution like it's a known thing without teaching how to tackle the problem. You have to teach what parts of the question do we have to identify that is relevant for the question. If we see certain wording we should know that we should use a certain method. Standardise the methods for the solution. It's impossible to learn 50 unique solutions that has been thought in different ways. Standardise to methods for how to solve problems with disturbance attenuation, and questions about model uncertainty and robust stability, finding a controller from given information. I did most of the exercises until I realised that I wasted time and I would need to teach myself everything from limited exam solutions. And I was right. I taught myself everything on how to generalise the methods so I had less stuff to memorise. I learnt nothing from the exercises. Both the recorded and the classroom exercises were too fast paced and it was difficult to process what was said.

The solutions need to improve. Too many assumed stuff that just appears. For example the question might ask to find frequency for bandwidth using the gain and small gain theorem. Then it doesn't make sense to use $\text{gain} = 1$ instead of $1/\sqrt{2}$. Additionally, there needs to be more middle steps that helps us to learn how to solve the questions. Maybe don't need to fix the solution before the exam or right after but good solutions should exist after the summer.

Try to see if it's possible to make the lectures more interactive. Everything ends up with going in one ear and out through the other few hours after the lecture. We write down everything but don't learn in this way. I find written materials difficult to learn from when it's something new. They are good to read after the lecture.

More thorough exam and exercise solutions, so you can learn even if you can't go to the exercise sessions

What would you suggest to improve? (I worked: 15-17 timmar/vecka)

Difficult to remember certain things but it would be nice if more examples of the difficult topics were implemented. I also wish you could fix the damn water tanks since it felt that they all had some form of problem, or make something more interesting that can be used for the labs.

What would you suggest to improve? (I worked: 18-20 timmar/vecka)

It would be better if TA could explain exercise questions at a bit slower speed. It would be better if each exercise question has the corresponding answer (some of the answers in main.pdf are missing)

The timeline for the labs; the way it was is that lab4 and the water tank lab overlapped, so in order to make the Glover controller you had to have finished lab4.

The setup for the water tank lab, I have talked to multiple groups who mentioned they had problems with their setups.

What would you suggest to improve? (I worked: 21-23 timmar/vecka)

The lab project had a relatively tight timeframe, which in many ways is fine and I like it. The booking system through canvas made it very hard to find a follow up-time though, as you couldn't book both occasions simultaneously.

What would you suggest to improve? (I worked: 24-26 timmar/vecka)

The water tank stations in the lab hall for the project need some maintenance like replacing the tubes for example. Also, it might be a good idea to hint at using the statically decoupled controller in the task description for the second part of the lab instead of saying "Choose the best controller" which would be dynamically decoupled one since that had the best performance in the simulation, however, for the real system it produces an unstable behaviour.

What would you suggest to improve? (I worked: 27-29 timmar/vecka)

Gave more tutor explanations in the project. The tutor does not really well explaining about project, and it was hard to ask the question if you get bad result from experiment

What advice would you like to give to future participants?

What advice would you like to give to future participants? (I worked: 9-11 timmar/vecka)

Read the lecture notes after the lecture and start with exams already in the third/fourth week of the course. The solutions are bad and you will need to ask questions about the solutions. Asking for help is not possible at the end of the course when getting the help on Canvas is not the same compared to getting help on the spot in the classroom.

What advice would you like to give to future participants? (I worked: 15-17 timmar/vecka)

Have a plan and follow it, especially for the exercises. Highlight the lecture notes so you can easily access the core information and make it easier to remember, easy to do since it's digital. Do the labs as soon as possible, the later ones are quite easy to mess up and you might need to invest more time than planned which leaves you with less time to study for the exam.

What advice would you like to give to future participants? (I worked: 18-20 timmar/vecka)

Start studying from day 1

attend each lecture and exercise session is really helpful for understanding

Start exam preparation early, one week is not enough. The solutions to the previous exams are not thorough and are hard to follow so they will take time.

What advice would you like to give to future participants? (I worked: 24-26 timmar/vecka)

Throughout the course, make an effort to complete all the exercises each week.

What advice would you like to give to future participants? (I worked: 27-29 timmar/vecka)

It was really hard course so spend your wisely from beginning

Is there anything else you would like to add?

Is there anything else you would like to add? (I worked: 9-11 timmar/vecka)

Help the TAs to have good solutions for the exercises. They were new to teaching and probably needed to make their own solutions. If the solutions/notes are made pedagogical from the beginning then the TAs can teach it in a pedagogical way.

Is there anything else you would like to add? (I worked: 18-20 timmar/vecka)

Some questions in the project are hard to implement (especially for the non-minimum phase case). It would be better if more details could be provided in the instruction pdf to solve these questions

Overall a very good course, it was very insightful. The topics and controllers that we learned about were interesting.

Is there anything else you would like to add? (I worked: 24-26 timmar/vecka)

There was one occasion where me and my project group had booked a lab session and unfortunately there was no TA present to let us in the lab. Thankfully there was an exercise taking place at the same time which we went to to receive the keys to the lab, however, if we weren't lucky we would have potentially never gained access to the lab that day.

SPECIFIC QUESTIONS

RESPONSE DATA

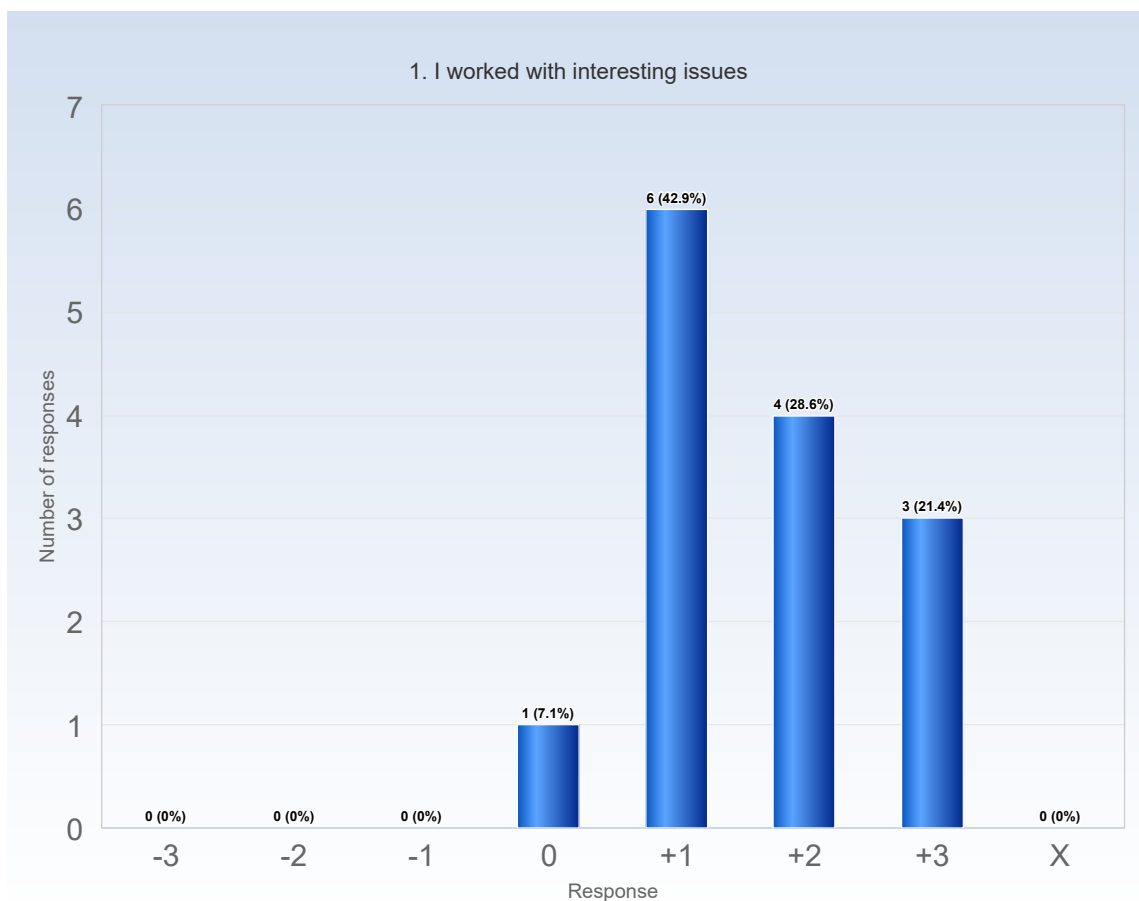
The diagrams below show the detailed response to the LEQ statements. The response scale is defined by:

-3 = No, I strongly disagree with the statement

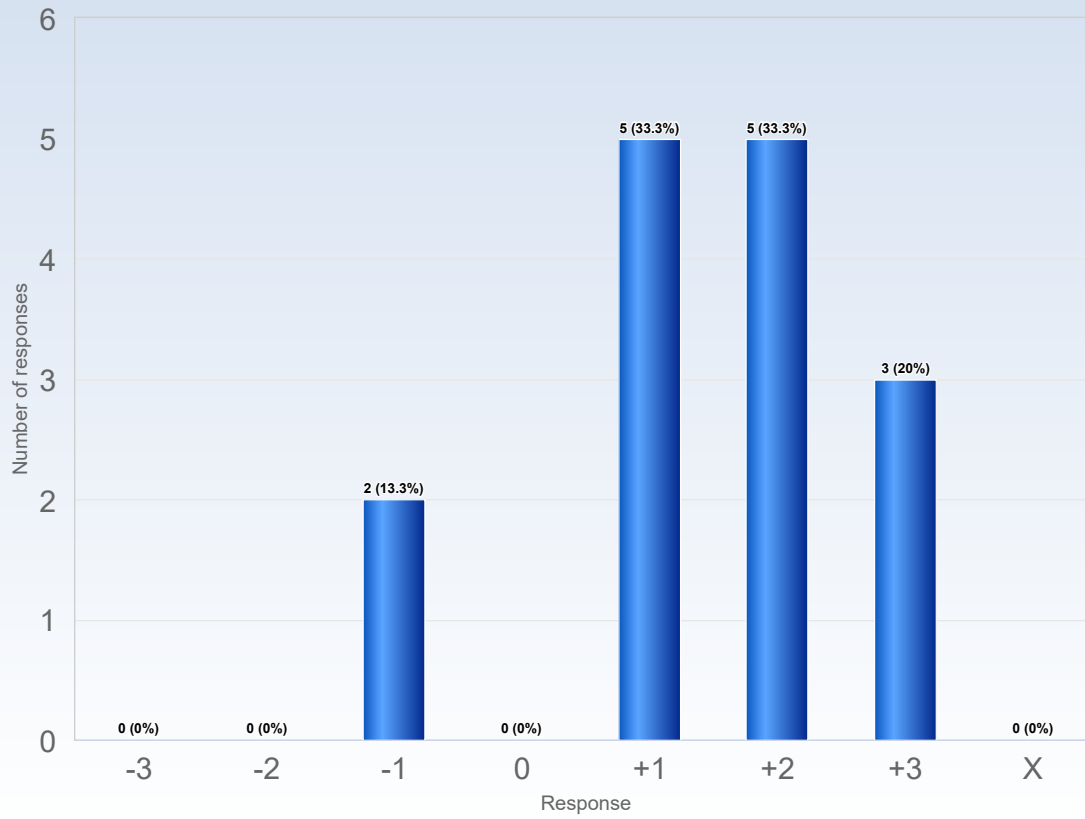
0 = I am neutral to the statement

+3 = Yes, I strongly agree with the statement

X = I decline to take a position on the statement



4. The course was challenging in a stimulating way



Comments

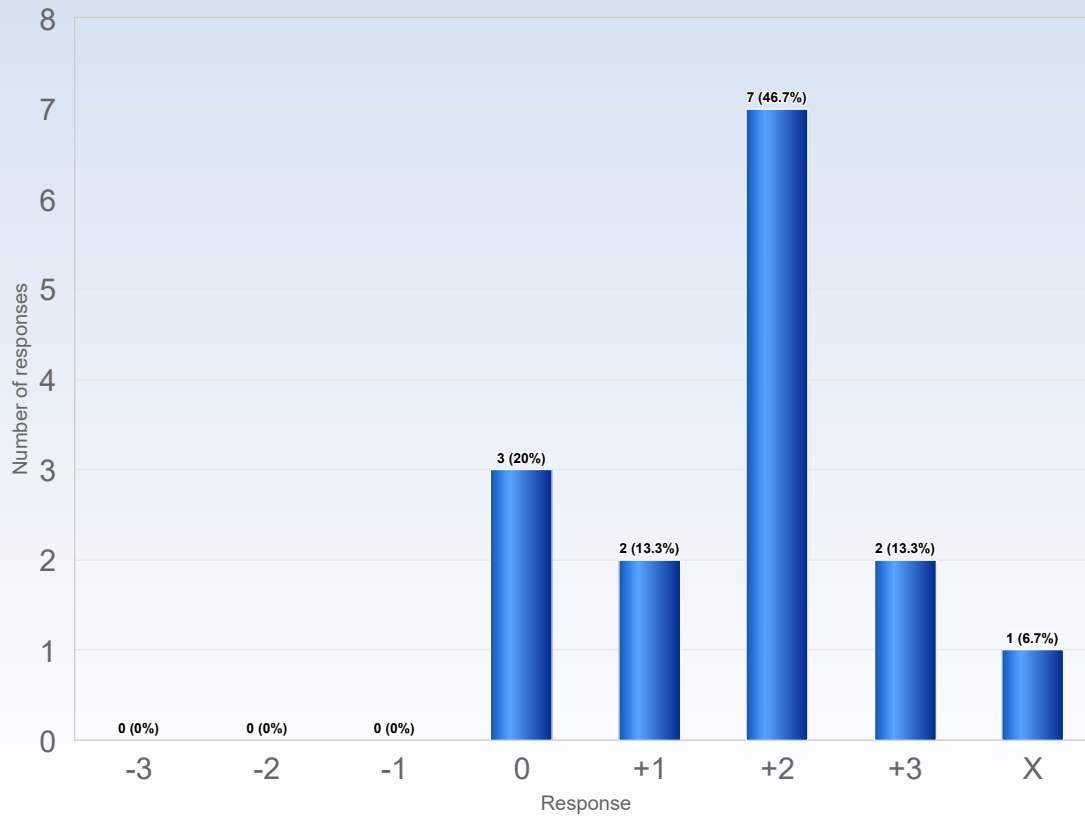
Comments (My response was: -1)

The challenge was understand what I learnt from the lesson. Not funny when you did not understand

Comments (My response was: +3)

The lab exercises were very informative and gave a lot of knowledge over different control concept

7. The intended learning outcomes helped me to understand what I was expected to achieve

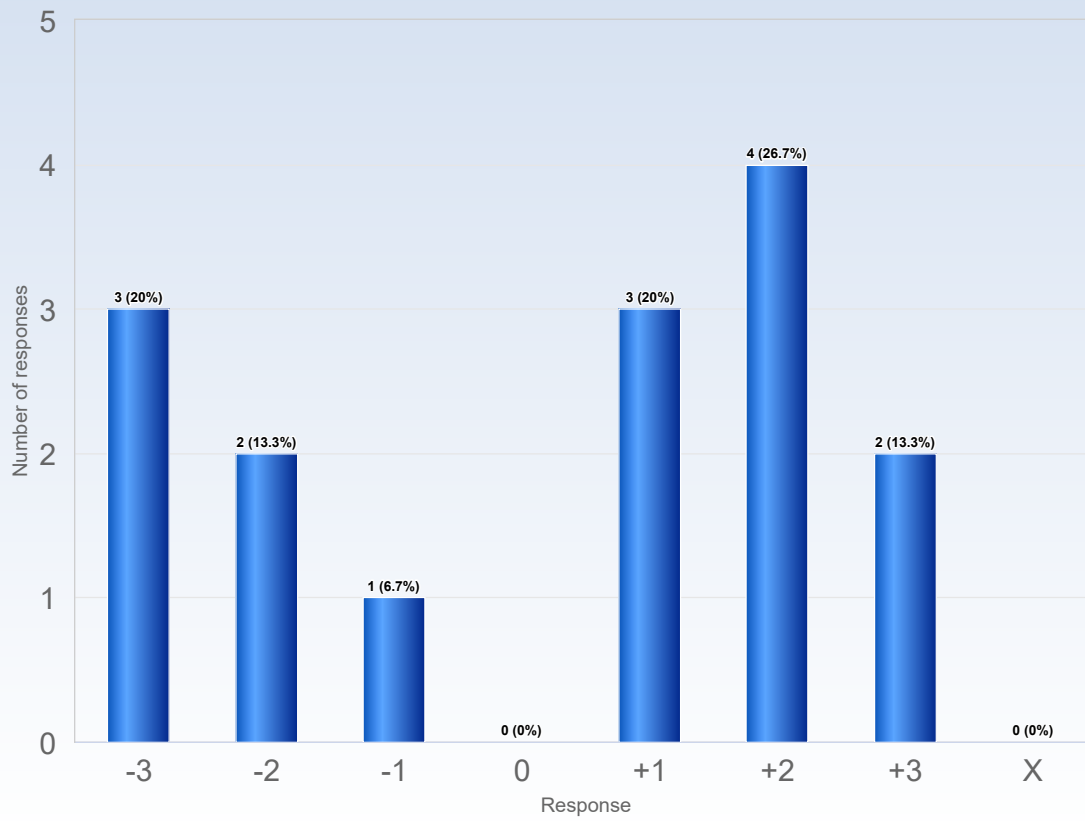


Comments

Comments (My response was: X)

Did not read the intended learning outcome for the course

10. I was able to learn from concrete examples that I could relate to

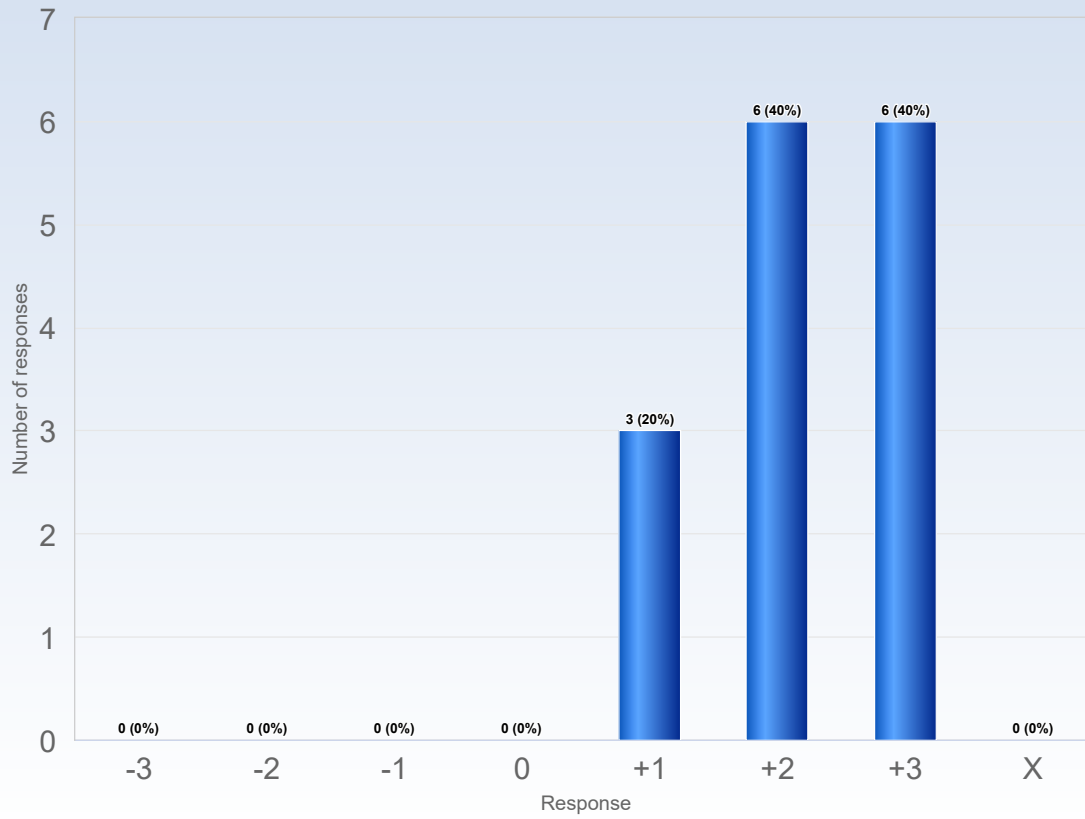


Comments

Comments (My response was: +1)

The lectures had some nice real life examples when it was possible. Examples relevant for the exam also on the lectures notes that I appreciated.

11. Understanding of key concepts had high priority



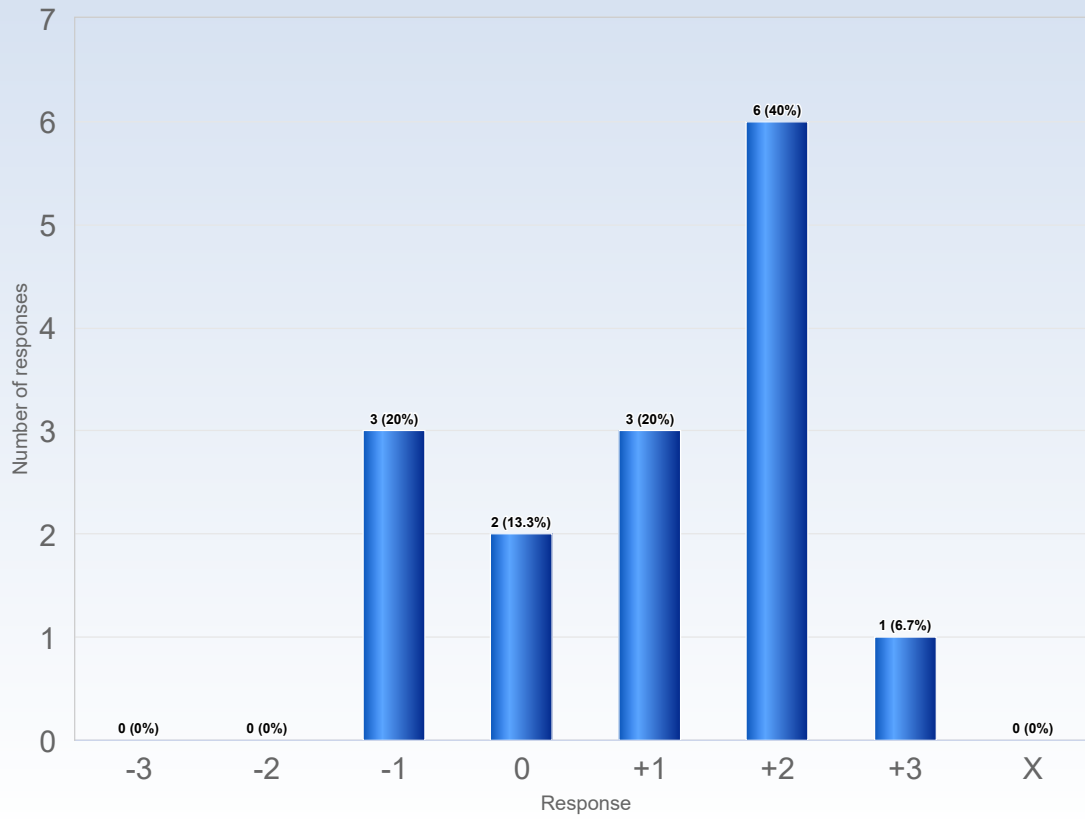
Comments

Comments (My response was: +2)

Sometimes they are introduced too anonymously though

Yes, I noticed there were a focus on teaching the concept, but we did not learn anything. Most importantly I couldn't apply on the exercises

12. The course activities helped me to achieve the intended learning outcomes efficiently

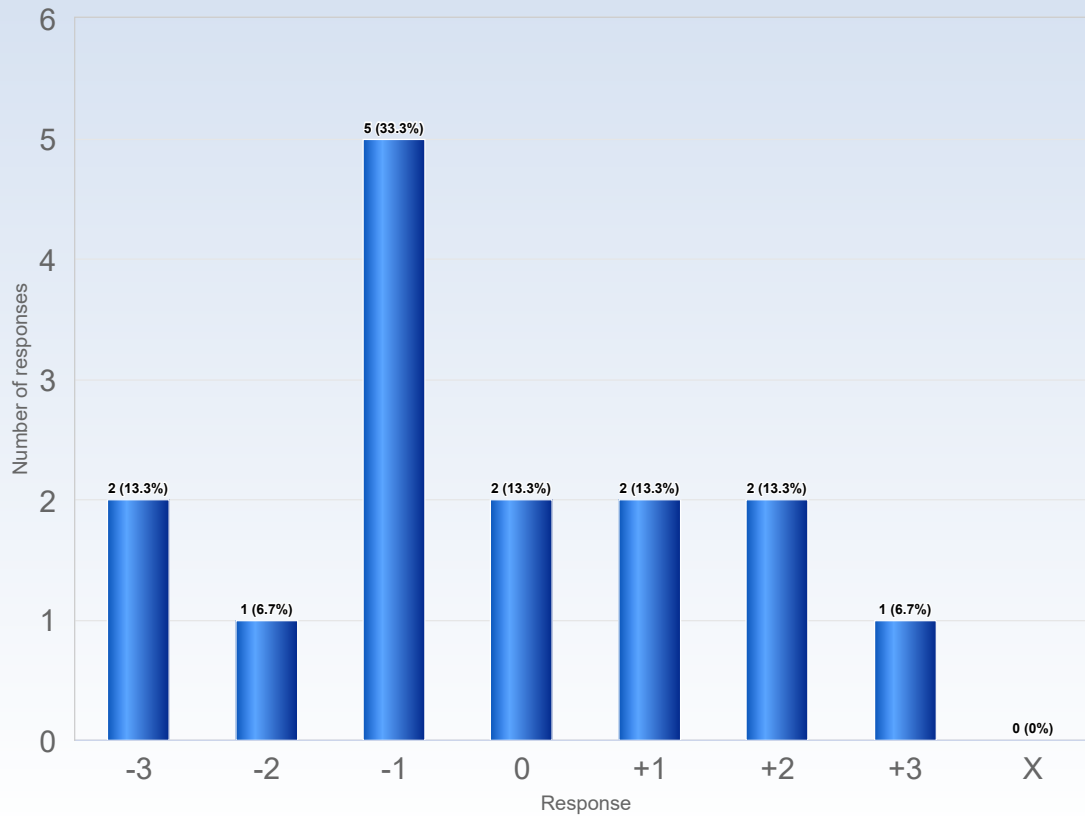


Comments

Comments (My response was: +1)

I think the labs did do their job for us to learn techniques and how to work with matlab. The recorded exercises were difficult to follow with bad chronological order to present the solution.

15. I was able to practice and receive feedback without being graded



Comments

Comments (My response was: -2)

No, there were no feedback on the lab assignments. No partial exam put tasks with difficulty level close to the exams. If there were and we got feedback then it could have shown results.

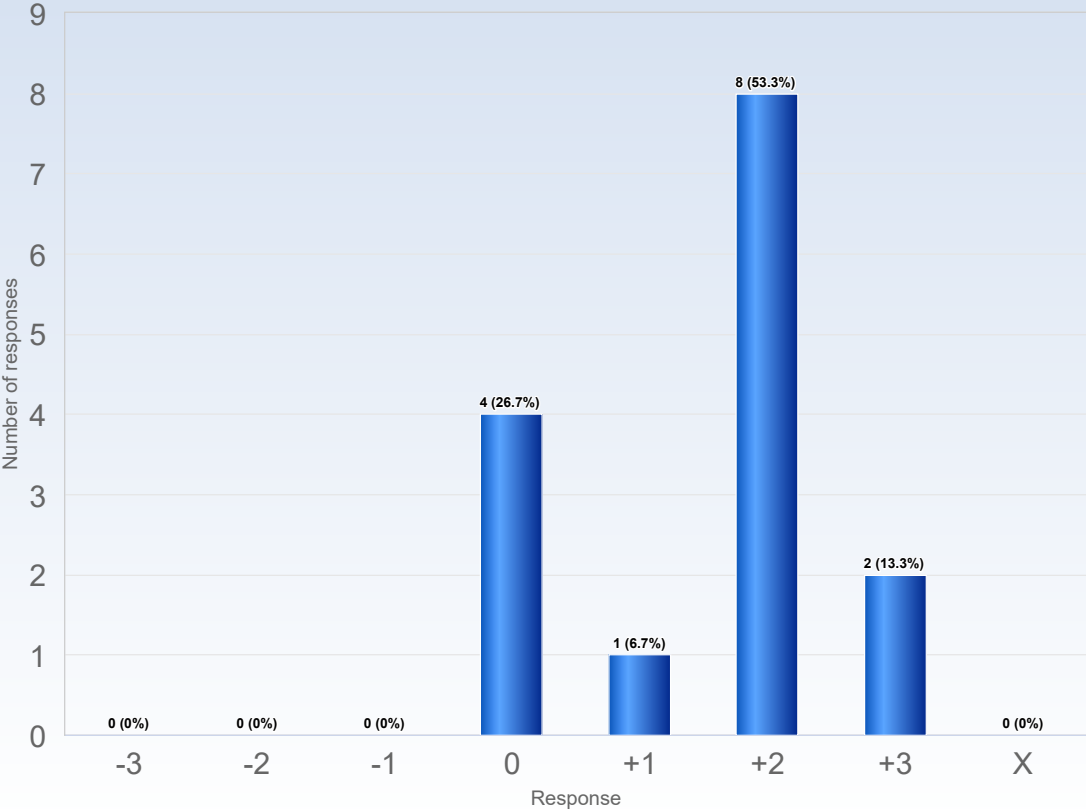
Comments (My response was: -1)

Would have liked to see more practice problems recommended for each module

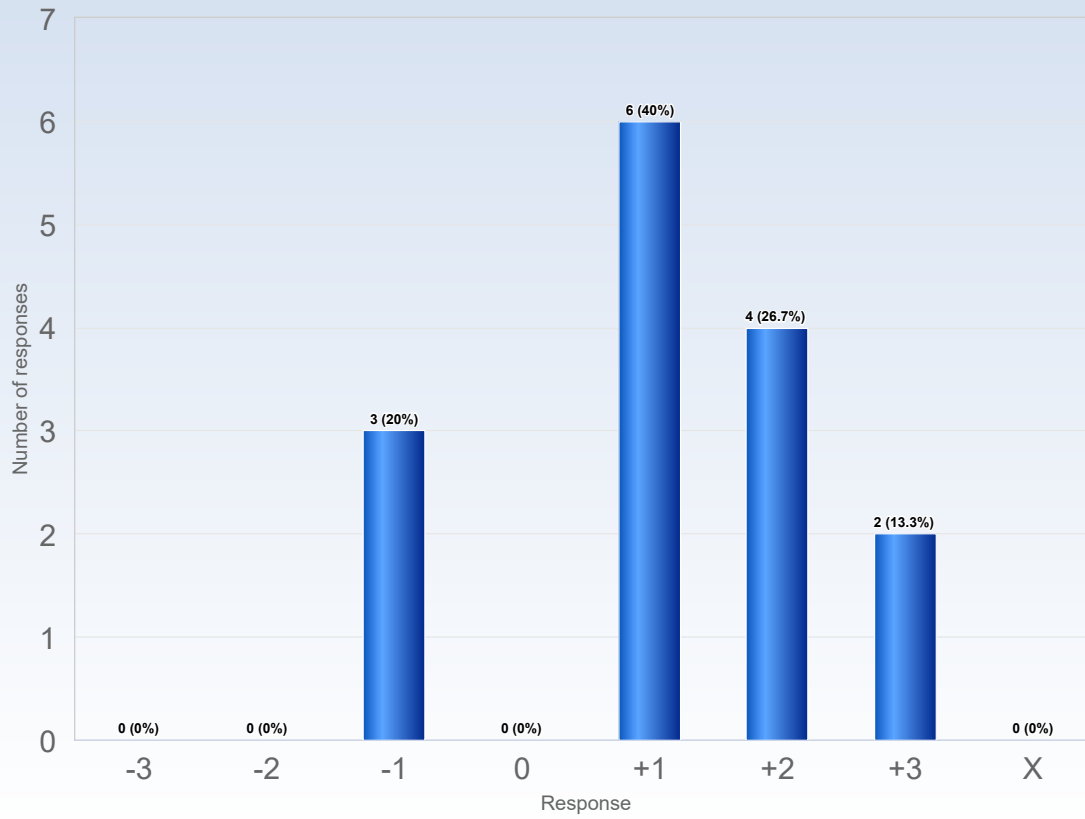
Comments (My response was: +1)

It was unclear what was required to present on the report for the water tank lab

16. The assessment on the course was fair and honest



17. My background knowledge was sufficient to follow the course



Comments

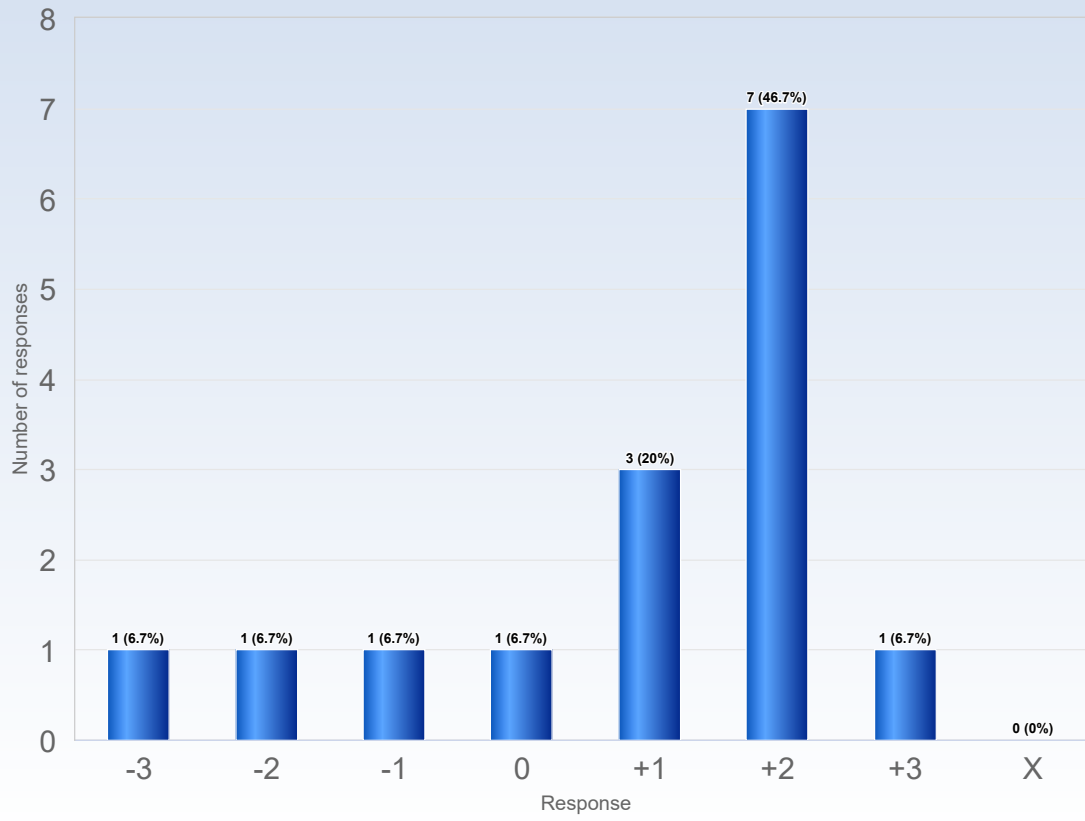
Comments (My response was: -1)

Originally from mechanical engineering

Comments (My response was: +2)

I was surprised that I did not need that much knowledge from the basic course. I found basic course very hard to understand and only knew basic stuff. Luckily it was enough for this course.

19. The course activities enabled me to learn in different ways

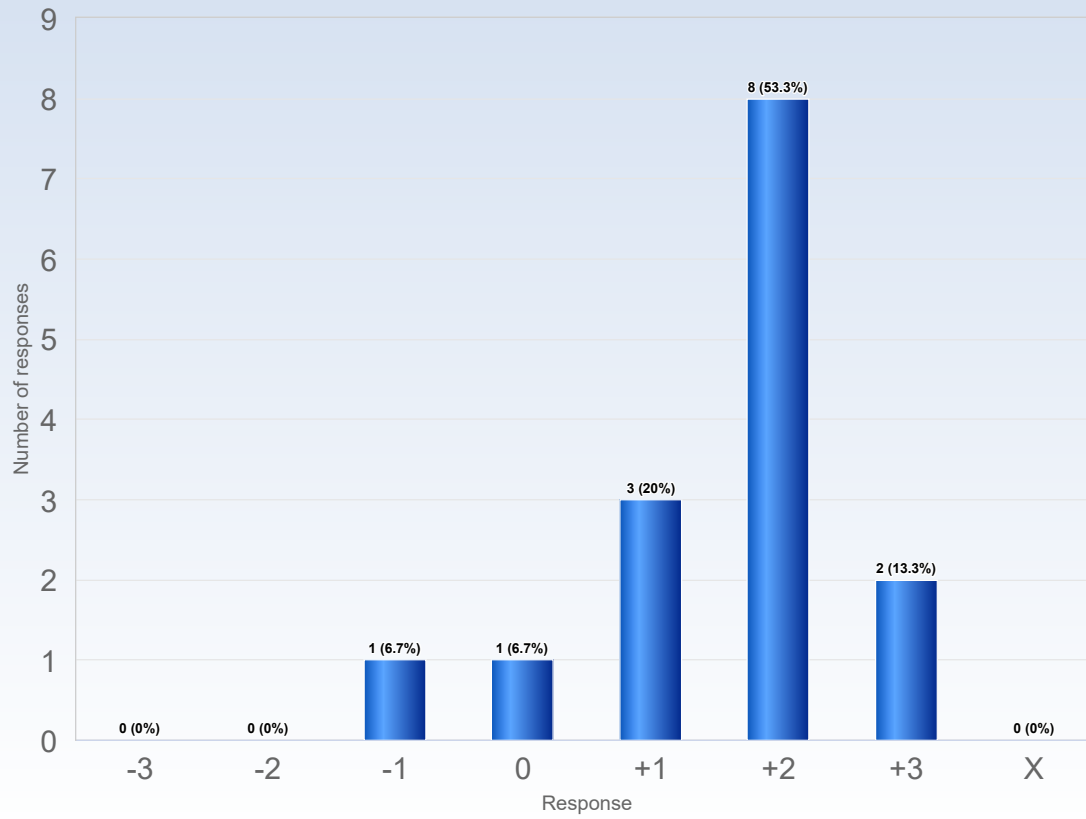


Comments

Comments (My response was: +2)

I think it's fine with exercise and labs.

21. I was able to learn by collaborating and discussing with others



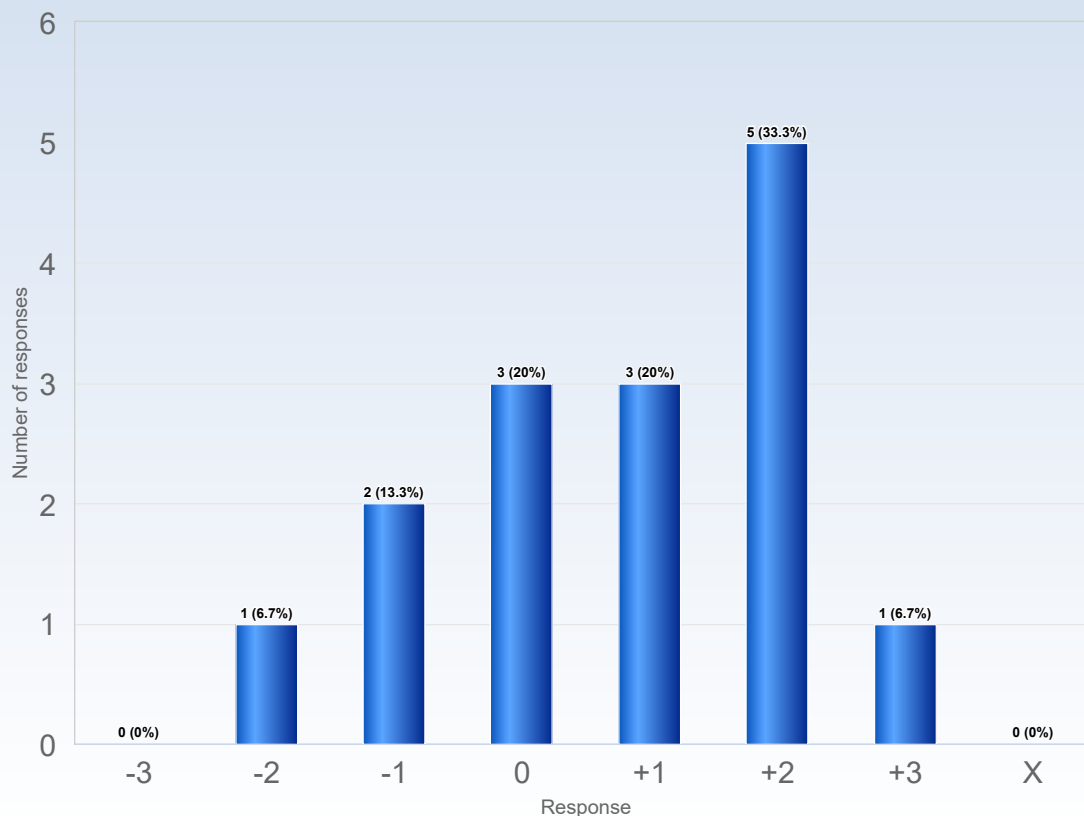
Comments

Comments (My response was: +2)

For the labs yes. For exercises no. People don't either go to exercise, don't understand or done the homework. In this way could not discuss with others

Unless youre a genius this is kinda something you have to do.

22. I was able to get support if I needed it



Comments

Comments (My response was: +2)

Yeah I appreciated the discussion forum. Would wish that the discussion forum for the exam was opened earlier and longer

SPECIFIKA FRÅGOR

SPECIFIKA FRÅGOR

maybe it would be great if the relationship between the previous lecture and the next lecture could be explained more in detail in online video No you can't. People will choose either online or classroom with the way it is. If you want to maximise the possibilities this combination has, you would need to start with flipped classroom. Even though this sounds good in theory it will still not work in practice. We students are too busy with our project courses such that this course is prioritised later. So they will skip the lectures. The recorded lectures almost works as normal lectures that we can use when skipping class. If you do with flipped classrooms, these recorded lecture would maybe have less material. To get all material you would need to go to the lecture or read lecture notes (which everybody does not do). Keep as it is for now until someone comes up with good solution and there are resources to do it. A good change would require time and effort from KTHs side. To my experience few teachers have the time to do this cause I have seen it and experienced it myself as a TA.

Remake some of the videos in the lecturer. It is already good but sometimes it is confusing in some parts. It would more be appreciated if you can make the simple animations of the project videos

I enjoyed the online exercise videos. Maybe do kore stuff like that

Online teaching should free up the professor to come up with improvements on practical activities, e.g. improvements on the water tank system.

I'm fine with the professor using old recorded videos for teaching as long as the prof is responsive to questions in the forum / messaging

If the prof wants to re-use old lecture videos, a good system would be to have a designated period where students are expected to watch the video, during which the professor is highly available, i.e. can reply to questions almost immediately.

Only thing i can think of to improve the videos is to film the current live lecturers(not zoom but the in-person) and upload those as well. Since they contain more information and examples they will be very good to be able to look back on. I understand that less people would go to the live lectures, but upload them after each lecture so that people could still come and possibly ask questions there live.

I very much liked the extra material provided. In the end I started only reading the lecture notes only. The lecture notes are very good! and very well written.