Course analysis SK1118, HT22
Author: Max Yan, maxyan@kth.se
Date: 2023-01-31

Course information
Course code: SK1118
Course name (English): Electromagnetism and waves
Course name (Swedish): Elektromagnetism och vågrörelselära
Points: 7.5
Programme: CINTE (Swedish), TCOMK (English), (and students from previous IF1613)
Period: 2
Responsible: Max Yan
Examiner: Urban Westergren
Teacher of lectures: Max Yan
Teacher of exercises: Richard Schatz
Teacher of Labs: Richard Schatz, Felix Vennberg, Albert Peralta Amores (coordination: Marina Zelenina)

Course design
Physical lectures (13), exercises (9), and labs (2) were given without online streaming or recording. Pre-exam (1 session, 3hrs) and final exam (5 hrs) were held physically. One extra exercise (räknestuga) was coordinated by Richard just before final exam.

Other major changes of the course since its last instance: English compendium "Electromagnetism under 100 pages" was improved before and under the course period, with more exercises added especially for "Magnetostatics". Solutions to exercises as well as hints were added in Appendix. Paces were slowed down a bit further. Some key calculations examples (e.g. integration through Coulomb's law to get electric field at a point from a charge distribution) were demonstrated during lectures on blackboard.

Meeting with students during the course
No special meeting was arranged during the course. Constant feedbacks were obtained during the lectures/exercises or through Email.

Students' results
Registered for course: 60. Registered for exam: 56. Attended for exam: 40
Passed exam: 32 (80%) (Re-exam to be held in April is not considered.)

Students' opinions
Questionnaire was electronically sent out to students after the course (Appendix). 16 submitted replies (Appendix). The questionnaire comprises of five sections: ***General***, ***Lectures***, ***Exercises***, ***Labs***, ***Others***. Below are summaries of the student's opinions on the sections.

- ***General***: Most students were very clear about the goal of the course in the beginning, satisfied with the course description, well informed during the course, and found the course material easily. Like last year, most students (11 out of 16) used the English compendium; among them, 9 students think it's "good" or "very good".

Opinions about the Swedish textbook were averaged a bit above "neutral" (9 replies in totals). These opinions about textbooks are in line with last year's. Majority of the students super-liked "having a pre-exam".

- ***Lectures:*** (Throughout the course, Max observed there were usually 20-30 students attending the lectures.) Out of 16 students who responded, 12 followed >75% of lectures. Most students think the lectures' tempo and difficulty level are fine, but some think the tempo is a bit fast and difficulty level is slight too high.
- ***Exercise:*** Attendance to the exercise sessions appears to be less than last year. About half number of students surveyed attended >50-75% sessions. They though difficulty level is in general OK but slightly on the difficult side. Tempo were just perfect, as was in last two years.
- ***Labs:*** Opinions on lab instructions are very mixed. Some wrote in free-text field that Lab 1 instruction appears to be more difficult than it actually is. Difficulty levels, and tempo are all very good.
- ***Others:*** When it comes to preparedness to the course, answers were mixed, reflecting dynamic background of the students. At least more than half who replied said they were properly prepared by their previous studies. Most of them think mathematics in this course is manageable. The course does not combine that well with other course(s) under P2, as pointed out by some; but majority found no problem. Workload per credit is found to be OK. Time spent on the course per week lands at 5-15 hrs/week, including lectures and exercises. Difficulty level for both pre-exam and final exam are found to be just OK for most students.

Analysis and comments

Issues identified:

- Lecture pace is still found to be fast by some students, sometimes "very fast in the most important part".
- English compendium is still weak on some aspects, like "waves/poynting vector".
- Some students were weak with math. Some introduction in the beginning is needed.
- Lack of instruction regarding if students shall solve the exercise problems before attending the exercises sessions.
- Attendance to exercises appears to be less.

Positive observations:

- Attendance to lectures is improved.
- Most students think the course is good, interesting, fascinating. (See attached free-text comments).

Planned course development

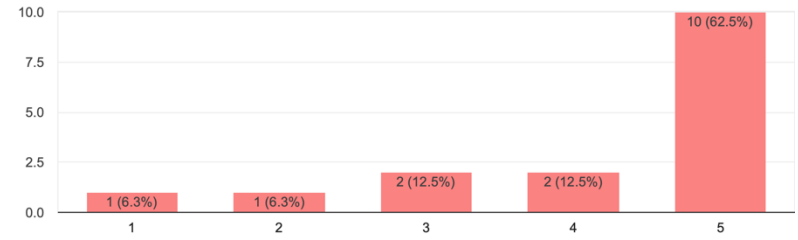
- Pace of the lectures is hard to be slowed down due to the number of lectures (13) decided for the course. We have 2-3 lectures per week. It is not a good idea to have 4 or more lectures per week. Therefore, I will put more emphasis on certain topics which are more relevant to TCOMK/CINTE programs, rather than trying to clarify everything. I will also give reading/self-study guidelines, so students can learn more by themselves outside classroom. Self-reading parts in English compendium will be expanded with more exercises/examples, or link to other resources.

- Further editing of compendium. More examples/exercises will be added especially for “electromagnetic wave” subject.
- Lecture content: Besides lecturing with slides, adding some more examples which show applications of the derived formulas.
- More applications can be mentioned during lectures. Maybe some demos?
- Some math basics will be introduced a bit more concretely during the first lecture. Or more math examples in the English compendium (chap. 1).
- We will clearly recommend students to solve (certain) exercise problems before attending the exercise sessions. We may consider selecting one or two “easier” problems to facilitate their attempts.
- Currently we have both labs on optics. From 2023 HT onwards, Lab 2 “Optical fiber lab” will be replaced by “Magnetic induction (To build a clamp ammeter)” lab to better reflect the course content.

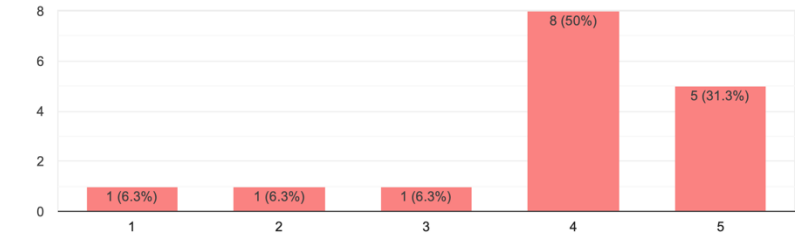
SK1118 HT2022 Course survey results
Sent: 2023-01-12; closed: 2023-01-30
(16 responses in total)

GENERAL (ÖVERGRIPANDE FRÅGOR)

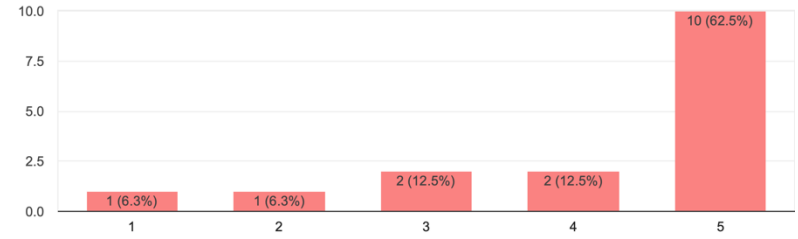
How was the information during the course? (Hur har informationen varit under kursens gång?) [1-Not clear at all; 5-Very clear]
16 responses



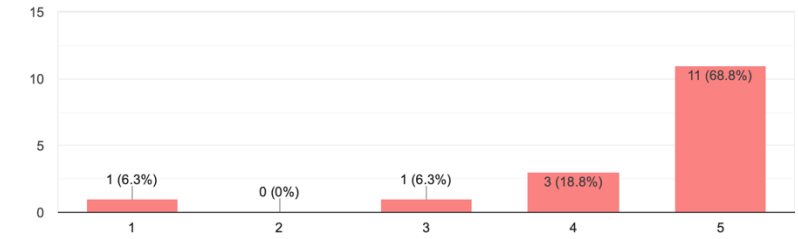
How clear were the goals of the course when it started? (Hur bra framgick kursens mål vid kursstart?) [1-Not clear at all; 5-Very clear]
16 responses



How was the information during the course? (Hur har informationen varit under kursens gång?) [1-Not clear at all; 5-Very clear]
16 responses

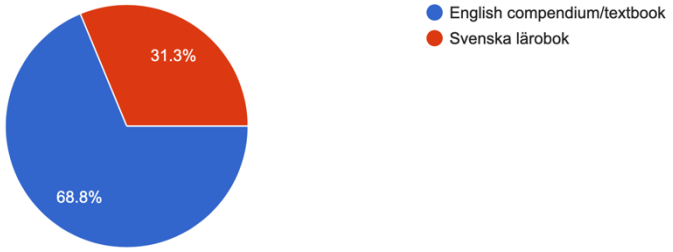


How was the access to the course material? (Hur var tillgången på kursmaterial?) [1-Very difficult to locate; 5-Very easy]
16 responses



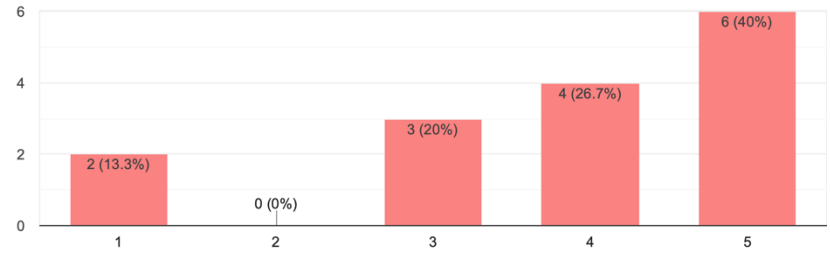
Which textbook have you used mostly? (Vilken lärobok har du mest använt?)

16 responses



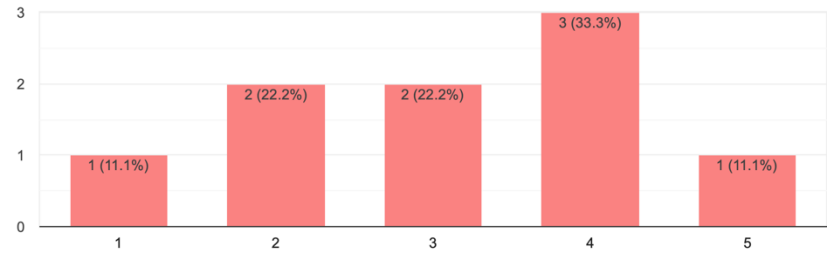
What do you think about the English compendium? [1-Not good at all; 5-Very good]

15 responses



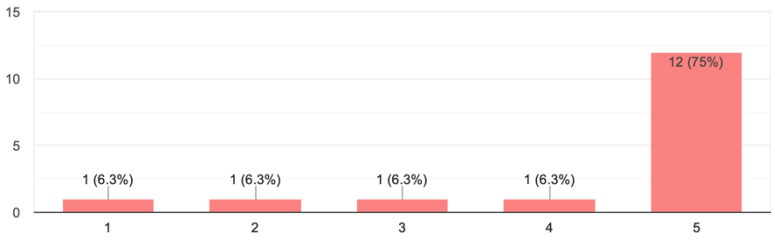
Vad tycker du om den svenska läroboken? [1-Mycket dåligt; 5-Mycket bra]

9 responses



What do you think about having a pre-exam? (Vad tycker du om att det finns en kontrollskrivning?) [1-Not helpful; 5-Very helpful]

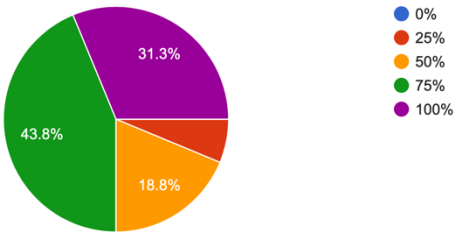
16 responses



LECTURES (FÖRELÄSNINGARNA)

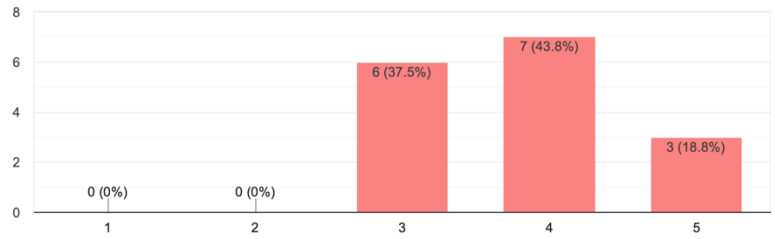
How many per cent of the lectures did you participate in? (Hur stor procentdel av föreläsningarna deltog du i?)

16 responses



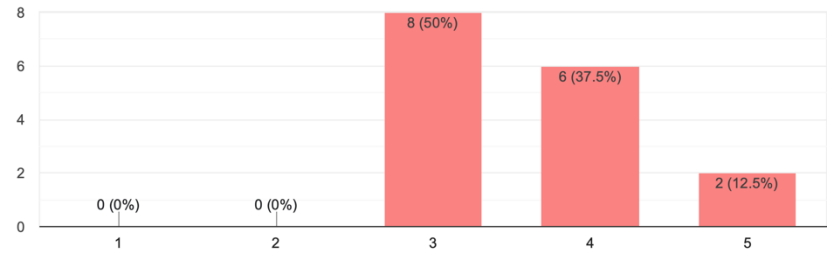
How was the difficulty level of the lectures? (Hur var svårighetsnivån på föreläsningarna?) [1-Too easy; 5-Too difficult]

16 responses



How was the tempo of the lectures? (Hur var takten på föreläsningarna?) [1-Too slow; 5-Too fast]

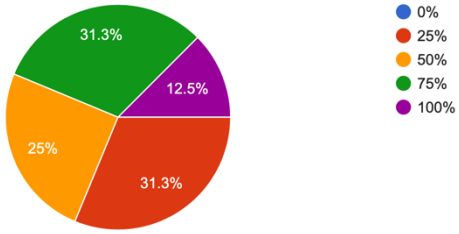
16 responses



EXERCISES (ÖVNINGARNA)

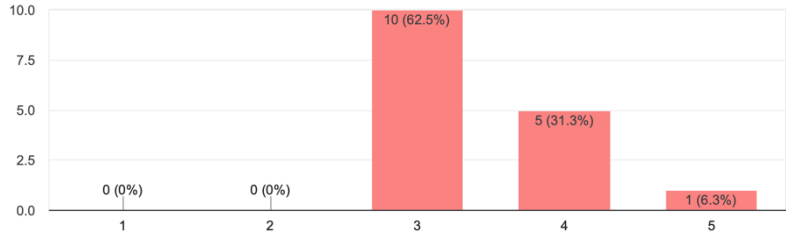
How many per cent of the exercises did you participate in? (Hur stor procentdel av övningarna deltog du i?)

16 responses



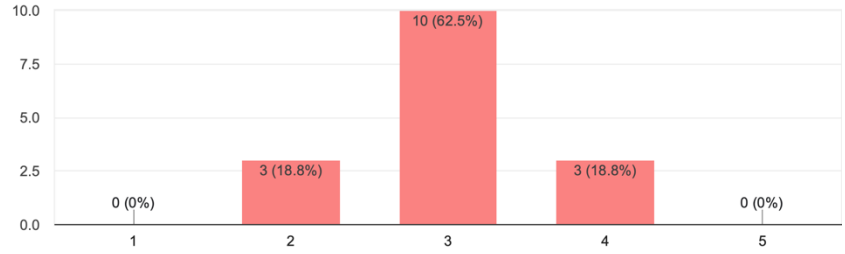
How was difficulty level of the exercises? (Hur var svårighetsnivån på övningarna?) [1-Too easy; 5-Too difficult]

16 responses



How was the tempo of the exercises? (Hur var takten på övningarna?) [1-Too slow; 5-Too fast]

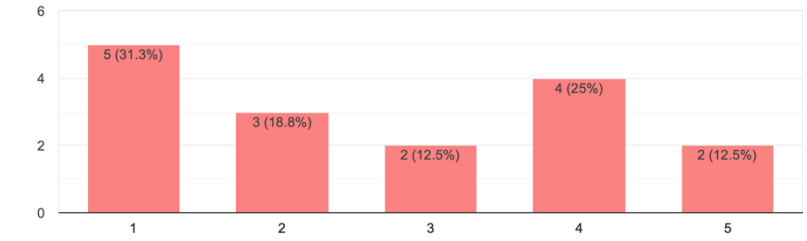
16 responses



LABS (LABORATIONERNA)

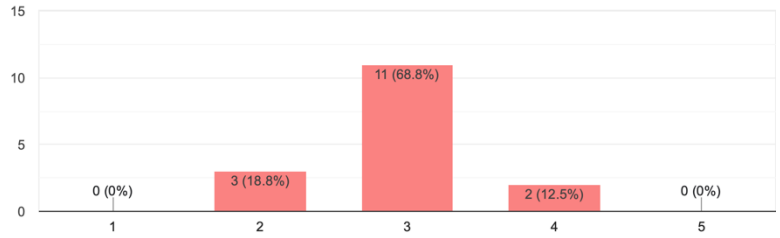
What do you think about the laboratory instructions? (Vad tycker du om laborationsanvisningarna?) [1-Very good; 5-Very poor]

16 responses



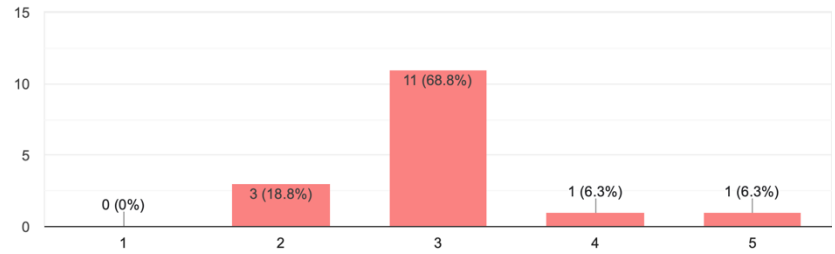
How was the difficulty level of the labs? (Hur var svårighetsnivån på labbarna?) [1-Too easy; 5-Too difficult]

16 responses



How was the time length for the labs? (Hur var tiden på labbarna?) [1-Too long; 5-Too short]

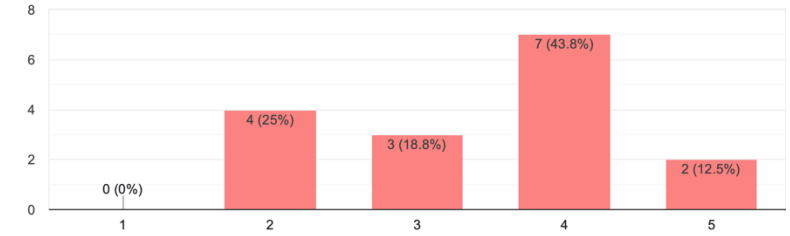
16 responses



OTHER QUESTIONS (ÖVRIGA FRÅGOR)

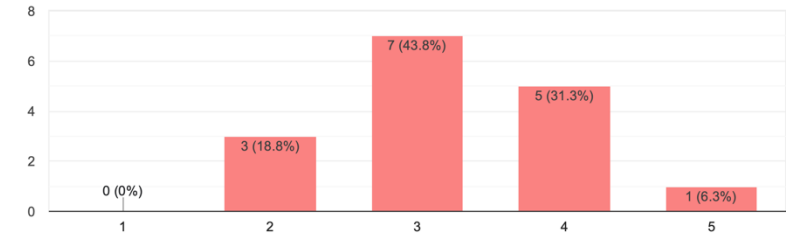
How well have your previous studies prepared for this course? (Hur bra var dina förkunskaper?) [1-Very poorly; 5-Very well]

16 responses



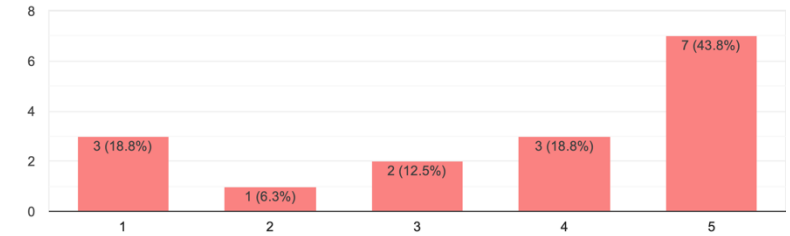
How was the level of mathematics in the course? (Hur var den matematiska nivån i kursen?) [1-Too easy; 5-Too difficult]

16 responses



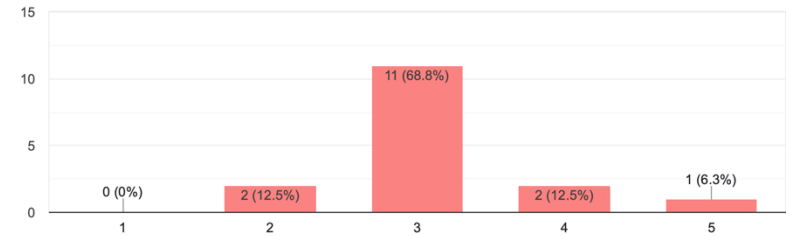
How was the combination with other parallel course(s) in period 2? (Hur gick studierna att kombinera med den parallella kursen i period 2?) [1-Difficult to combine; 2-Easy to combine]

16 responses



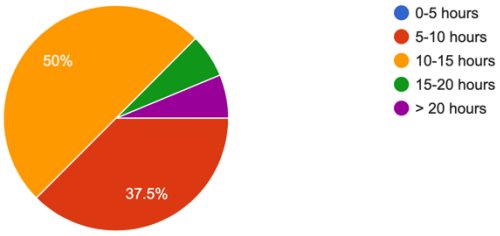
How was the workload in comparison to the number of credits? (Hur var arbetsbördan i förhållande till kurspoängen?) [1-Too little work; 5-Too much work]

16 responses



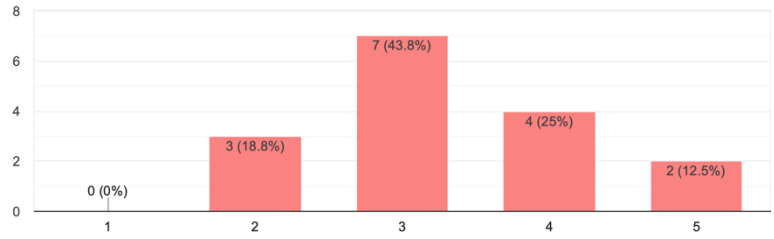
How many hours per week did you study during the course? Include lectures etc. (Hur många timmar per vecka studerade du under kursen? Inkludera föreläsningar etc.)

16 responses



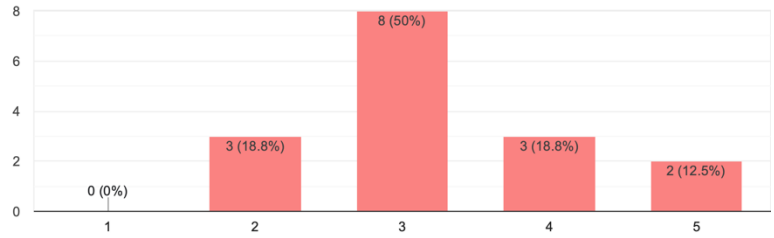
What do you think about difficulty of the pre-exam? (Vad tyckte du om svårighet av kontrollskrivningen?) [1-Too easy; 5-Too difficult]

16 responses



What do you think about difficulty of the final exam? (Vad tyckte du om svårighet av tentan?) (1-Too easy; 5-Too difficult)

16 responses



SK1118 HT2022 Course survey results
Sent: 2023-01-12; closed: 2023-01-30
(16 responses in total)

Are you satisfied with the course generally? In what way would you like to improve the course? (Är du nöjd med kursen generellt? På vilket sätt skulle du vilja förändra kursen till det bättre?)

Yes, it was a very fun course, where all of you who worked in it were very friendly. It is not often you meet professors which are so flexible and understanding all the time! I really liked Richards open exercise which he held before the exam, it helped me a lot! Sometimes the pace on the lectures was a bit to fast. I would have liked if we had more lectures where Max has the time to derive the most important concepts in details! Overall i really liked the course!

it was fun course

Yes I am! However, the jump in difficulty from Electro- and Magnetostatics to Waves felt quite big, in my opinion. It was too easy to feel lost in that module, despite trying to understand it together with classmates. The main problem was that it felt more difficult to find relevant theory for problems/exercises in the Waves module compared to the other modules. One improvement (maybe?) could be that the lecture slides for the Waves module could have some more comments on it. It felt alright during the lectures thanks for the commentary by Max, but revisiting the slides it was difficult to understand a lot since the slides were more focused on images/equations rather than on text. Another improvement could be the scheduling. It was personally a little difficult to deal with this course and my other parallell course (IV1351 Data Storage Paradigms), especially since both Max and the professor for that course told us that their courses would have a high tempo at the start. Since my other course had contiuous examinations (project seminars and quizzes), it was at times very difficult to keep the pace with this course. In general, the course still felt good. Before the course started, I was a bit afraid of how challenging I knew this course would be. However, in the end, I thought this course was fun and interesting. Thank you for this course!

Jag är nöjd med kursen men jag hade gärna haft övningsuppgifter i ökad grad svårighet. Tidigare kurser man haft har det varit A,B, C frågor, där A är bas och görs i förväg innan föreläsningen, B är efter föreläsningen och C är lite svårare

Although the subject was not of my particular interest, I was very satisfied with the course. It was obvious that Max Yan put a lot of effort into the quality of the course.

The course was really good and interesting!

I am very satisfied. Both teachers are very nice. I would only do something about how fast it went (add more sessions, for example, because it was very fast in the most important part). And maybe focus on the exercises and our questions during exercises, instead bringing up other topics sometimes.

Jag tyckte att föreläsningarna var riktigt bra (och roliga). Pre-exam var bra!

The excercises were superhelpful and really helped. I would like to see some more examples of how to solve problems with the formulas we derived in the lextures

I did all the exercises before going to them. That really helped me understanding the material. I think having some way of making that mandatory would have helped many more students. In a past course called embedded electronics there were 6 exercises which 6 problems each and it was mandatory to attempt 20 problems in order to be able to go to the exam. I think something similar would be a great.

I was overall very satisfied with the course. There were, however, times when the lectures + compendium did not provide enough information for me to understand. Specifically, when it came to the waves / poynting vector. I had to do some extra reading and finding the right book can be hard. I have used Fundementals of Physics by by David Halliday, Jearl Walker, and Robert Resnick. I liked the book and would therefore recommend that you also list this book or perhaps another alternative as a potential source for students who do not understand Swedish and want some more information besides the compendium.

Since I had very poor knowledge in multi variable calculus I struggled a lot with the mathematical aspect of the course, especially in the beginning. What made it work was my previous familiarity with basic concepts such as Coulomb's Law, to which I was able to apply basic integrals at the end of the course. I did miss out on the first exercise but wish that I had gone to it as I heard the mathematics was covered there. I would strongly advice future participants of this course to avoid my mistake and do attend the exercise, especially the first one. The best part of the course were the labs. I like that the themes were connected to the research areas of the professors. It automatically made the topics fascinating. The instructions for Lab 1 made it look very difficult. I could not comprehend the math described there and so I was very nervous for the Lab. Once I got there I soon realized that we would not need as complicated math to complete the Lab. I do wish this had been clearer in the instructions for the Lab. In general something that confused me during the course was that there seemed to be "hard" ways of solving some problems and "easy" ways of solving some problems. Hard being the ones involving multiple integrals for example and easy being the ones that only require understanding the problem according to physical principles and then applying formulas reminiscent of high school physics. For most of the course I believed that the hard way was the only way and was very worried about this. As it turned out the "easier" ways worked fine for most of the course. In general it was a very interesting and faschinating course and I am glad that I took it!