TEK/NAT Kursrapport

Kurs	*Kurskod*	*Poäng*	*År*	*Start v.*
Kvantmekanikens grunder	5FY157	7,50	2020	36

Institution	*Antal registrerade (män/kvinnor)*	*Antal aktiva studenter (deltagit i minst en examinerande del)*
Institutionen för fysik	4 (1/3)	-

Genomströmning (i %) och betygsutfall efter första tillfälle för examination (för varje betyg som satts på kursen ange antal som uppnått detta på formen ???

Genomströmning: 100% Betyg: G(4)

Hur mycket schemalagd lärar-/assistent-ledd tid har studenten tillgång till på kursen?

66 timmar

Hur är undervisningen upplagd?

24 Lectures
7 Problem solving/presentation sessions
1 Lab

För vart och ett av lärmålen (FSR:en) i kursplanen, beskriv kortfattat hur det examineras.

redogöra för kvantmekanikens grundläggande begrepp och postulat, såsom hermitska operatorer, Hilbertrum, superpositionsprincipen, sannolikhetstolkningen och Schrödingerekvationen, samt kunna beskriva och härleda centrala resultat såsom t.ex. osäkerhetsrelationen och egenskaper hos egenvärden och egentillstånd för hermitska operatorer

tenta

redogöra för kvantmekaniskt rörelsemängdsmoment och spinn samt kunna härleda centrala resultat om dessas egenskaper

tenta

beskriva egenskaper hos system av identiska partiklar

tenta

härleda och redogöra för väteatomens struktur, inklusive dess finstruktur

tenta

redogöra för tidsoberoende störningsräkning samt kunna härleda korrektioner av energier och vågfunktioner

tenta

redogöra för tidsberoende störningsräkning samt kunna härleda övergångssannolikheter för enklare fall

tenta

lösa kvantmekaniska problem i en dimension med tillämpningar på bl.a. tunnlingsfenomen och harmonisk oscillator

tenta

tillämpa stegoperator,

tenta

genomföra beräkningar på väteatomen och andra sfäriskt symmetriska system

tenta

genomföra beräkningar på enklare system med spinnande partiklar

tenta

applicera tidsoberoende störningsräkning på olika system

tenta

applicera tidsberoende störningsräkning på enklare fall,

tenta, inlämningsuppgift

utföra mätningar på atomära spektra samt analysera egenskaper hos dessa

tenta, laboration, muntlig redovisning

kommunicera resultat av experiment och presentera erhållna resultat i skriftlig och muntlig form

laboration

visa samarbetsförmåga med andra personer i laborativ miljö

laboration

reflektera över och värdera sin egen insats vid laborationsarbete

laboration

Beskriv hur betygssättningen på kursen fungerar. (Vilka betyg ges på kursen och hur sker bedömningen, dvs vilka delar betygssätts och hur vägs de samman? Finns det skrivtliga betygskriterier och/eller lärmål (FSR) för de olika betygen?)

Samläses denna kurs med andra kurser??

Ja

Om ja, hur många?

1

Hur stor andel av kursen samläses?

94%

Samläser flera program denna kurs?

Nej

Om ja, hur många?

1

Arbetar studenterna i projektform på kursen?

Nej

Om ja, uppskattad omfattning i poäng på projektdelen:

Antal projekt som varje student deltog i:

Antal studenter i projektgrupp:

Förväntades studenterna använda en projektmetodik för dokumentation och styrning (tex LIPS)?

Nej

Hur skedde indelning av studenter i projektgrupper?

Har studenterna uppmanats föra projektdagbok?

Nej

Om ja, Har dagboken utgjort grund för examination?

Kursens samverkan med forskning

Lärare som bedriver forskning (>25% av tjänsten) är aktiva på kursen

Annan samverkansform, nämligen:

Kursens samverkan med näringsliv eller offentlig verksamhet

Ingen samverkan med näringsliv/offentlig verksamhet förekommer på kursen

Annan samverkansform, nämligen

Genomförda förändringar till detta kurstillfälle

- First lecture updated with an overall overview and motivation of QM
- All lectures had a summary of what was done.
-The aim of each lecture was specified at the beginning
- Information related to the book was provided in each lecture and during important steps, so a better reference to the book was achieved (Which chapters/sections are we talking about)
- Updated structure for several lectures.
- Revised lecture about the lab theory.

Förändringsförslag från föregående kursrapport

- Look over the recommended problems. Add more simple problems with focus on conceptual understanding (teachers)
- Think about the problem solving sessions and see if there is any other way things can be done, e.g. divide the students into groups and make sure everyone gets the opportunity to present a problem (teachers)
- Better reference to the book during the lectures. Which chapters/sections are we talking about?
- Summaries of what was done and were we are heading in the beginning of (some) lectures.
- Group solving sessions?
- Find other sources to link from Cambro (e.g. good videos, and homepages with good content).

Lärare

Information om inblandade lärare

Kursansvarig

Eduardo Gracia

Antal övrig personal som ej föreläser

3

Antal övriga föreläsare

0

Hur stor del av den schemalagda tiden på kursen undervisas av forskande lärare (dvs lärare med mer än 25% forskning i sin tjänst)?

100%

Hur stor del av den schemalagda tiden på kursen undervisas av lärare verksamma i näringsliv/offentlig verksamhet (dvs lärare med mer än 25% av sin tjänst förlagd till näringsliv/offentlig verksamhet)?

0%

Kursvärd.

Totalt antal svarande

54 (sammanslagt m. Kvantmekanik 1)

Sammanställningsdatum

2020-11-06

När genomfördes kursvärderingen?

Efter genomfört första examinationstillfälle

För varje lärmål på kursen ange hur stor del av de studerande som uppger att det har behandlats på kursen - ange svaret i procent på formen
har behandlats/har inte behandlats/vet ej

redogöra för kvantmekanikens grundläggande begrepp och postulat, såsom hermitska operatorer, Hilbertrum, superpositionsprincipen, sannolikhetstolkningen och Schrödingerekvationen, samt kunna beskriva och härleda centrala resultat såsom t.ex. osäkerhetsrelationen och egenskaper hos egenvärden och egentillstånd för hermitska operatorer

100/0/0

redogöra för kvantmekaniskt rörelsemängdsmoment och spinn samt kunna härleda centrala resultat om dessas egenskaper

100/0/0

beskriva egenskaper hos system av identiska partiklar

100/0/0

härleda och redogöra för väteatomens struktur, inklusive dess finstruktur

100/0/0

redogöra för tidsoberoende störningsräkning samt kunna härleda korrektioner av energier och vågfunktioner

100/0/0

redogöra för tidsberoende störningsräkning samt kunna härleda övergångssannolikheter för enklare fall

100/0/0

lösa kvantmekaniska problem i en dimension med tillämpningar på bl.a. tunnlingsfenomen och harmonisk oscillator

100/0/0

tillämpa stegoperator,

100/0/0

genomföra beräkningar på väteatomen och andra sfäriskt symmetriska system

100/0/0

genomföra beräkningar på enklare system med spinnande partiklar

100/0/0

applicera tidsoberoende störningsräkning på olika system

100/0/0

applicera tidsberoende störningsräkning på enklare fall,

100/0/0

utföra mätningar på atomära spektra samt analysera egenskaper hos dessa

100/0/0

kommunicera resultat av experiment och presentera erhållna resultat i skriftlig och muntlig form

100/0/0

visa samarbetsförmåga med andra personer i laborativ miljö

100/0/0

reflektera över och värdera sin egen insats vid laborationsarbete

100/0/0

Sammanf.

Sammanfattning av åsikterna i kursvärderingen - positivt och negativt kring föreläsningar, seminarier, grupparbeten, laborationer, examination etc

Q: To what extent have the lectures aided you in your learning? (5 - very much, 1 - not at all).
4.47

Q: How can we improve the lectures in order to facilitate your learning?
-Weave in some more examples of actually applying the theory.
-I really think Eduardo stepped up his game with the lectures this year. The recorded lectures had better structure were more pedagogical and informative than they were berfore. Great job!
-More examples
-The lectures have been great, I can't think of anything that I would specifically like to change. The teacher was engaged and good at explaining!
-Sometimes write down the key points from the discussions around the subject for better understanding.
-Thought they were great.
-I think they were pretty good. Something I personally would like is a few more examples.
-The only real addition I'd have liked is a more clear graphical difference on the umu site schedule between on location activities and online lectures, maybe just an icon of a screen or whatever. Just so there are less steps involved in finding out how they're held.
-Honestly, these are some of the most engaging lectures I've had and considering most of it has been online whitch makes it harder to involve students all I can say is great work!
-Very hard to come up with some examples! This was the best learning experience since forever so. If I am being very fussy the only example i can come up with is that, in the most part you write very nice and clear text and equations on the board but a few times I had problem seeing what was written, but this you saved I believe every time when you was talking about what you just wrote so and this is a very small note.
-Honestly the video lectures were super good and there is not much that I think could be improved. Really great job!! I really liked the level of excitement and energy that Eduardo radiated during the lectures, it made everything so much more interesting and easier to understand .
-Eduaro was a really good teacher! Inspiring, pedagogical and fokused on what was important. I liked that he had a last lecture that was more from a historical view, but i wanted to see a real, fluffy, mjaoun cat...
-The way you had your lectures were verry good. It felt like a normal lecture even tho it was online. Good jobb.
-Clearer writing of small indices and the in general different /new symbols or letters. Eg in the beginning capital and smal psi
-Just a note to Eduardo if prerecorded lectures will Continue to be necessary: try to be more aware Of where on the board you are and how you position Yourself in regards to that, as not to cover some parts Of the board for note taking. For example instead of Standing in front of what have just been covered Just keep moving out of the frame.
-Maybe differ the problems that are presented so that they are different from those in Griffiths.
More examples would be nice :-)
-The lectures were very good, just make sure not to put them on a timer.
-The most importent thinks was only said, not written, so lots of the thinks I would had liked to look bak at was not in my notes.
-They were really good, maybe add more examples that are similar to the recommended problems.

Q: Do you have any suggestions for teaching methods which you think would benefit you in your learning? E.g. discussion sessions, seminars, group problem solving sessions, etc.

-I loved that the lectures were recorded such that one could pause to write of the board, listen to the explanations and rewind when one did not understand something that was said. Keep the recorded lectures and the half class problem solving sessions on campus as this has been the superior teaching format according to my learning style.
-I like the mixture of lectures, problem solving sessions (usually, though i did not like these as much as in other courses) and studying with my friends, so I can't think of any new suggestions.
-No i cant come up with something better than what we did.
-I think that discussion sessions would be a really good idea!! Quantum mechanics ia such an abstract subject and I think everyone would benefit from discussing what's actually happening
-Summary sessions were really helpful already

Q: Is it helpful for you to watch the teacher solve the problems? Can we arrange the problem solving sessions in any other way which would be better for your learning?

-Yes but Adrian sadly was very uninspiring to watch because it felt like he wasn't engaged in the lecture.
-The sessions felt uninspired compared to the lectures,
-It is helpful when the teacher is engaged and good at explaining. The teacher holding the problem solving sessions during this course was in my opinion not that great at explaining and engaging the students, the teacher mostly read everything straight from their own solution and wrote it on the bord.
-I did not participate in most of the problem solving sessions. The ones i participated in was fine. It was good that they where uppoaded online.
-It is but only when the person knows what they are doing. The teacher in this case only read from some notes and didn't seem like they knew what they were doing all of the time. They took a long time writing every part of the problem and were bad at answering.
-I found the lectures more engaging and the problemsolvings seemed more forced
-Not for me no.
-Problem sessions are generally good, but this time I felt like they lacked that energy and interesting aspects that I got from the video lectures
-It is normally helpful, yes. However, the teacher at the problem solving sessions was not very engaging and hence it got boring. It was better to use that time solving problems yourself.
-The Problem sovling sessions with Adrian were often really slow. The last problem solving session with eduardo was far more motivating and fun.
-More problem solving sessions would be helpfull.

Q: What is your opinion about the student presentation sessions? (Did the preparation and the sessions benefit you in your learning?)

-The preparation gave the most since when actually doing it you just had nerves and didn't really care about the problem. But solving the problems in great detail gave a lot of understanding how to solve the problems.
-I liked the problems and they really helped me learn quantum mechanics better but the presentation sessions could really use some serious improvement.
-Very good and reasonable amount of time spent for the bonus points
-I think the preparation was good since I got we could discuss and truly understand the problems together in a group. The

only thing I didn't like was that the problems took a while to do.
-The preparation was what benefited my learning most, presenting our solutions didn't really affect much of my learning. Listening to some other students presenting was helpful though.
-These were very good! The problems were challenging, but the extra points for the exam made it worth it ;)
-The preparation was good, the exercises took alot of time but aided me in my learning. I did not get too pressent my solutions orally, but it was a good learning experience too see how other students solved the same problems.
-I think it is a really good idea. It helped me a lot with my learning when you had to repeat the theory and the procedures thoroughly a while after first learning it. It made it really stick and I remembered a lot from the student presentations when I was studying for the exam and I think that says a lot. It was also great that you got extra points for it. It felt like a win-win situation. I do not think the presentation in itself helped but because of that you did the problems carefully.
-It was nice to have some more challenging problems to solve and any opportunity to get extra points is a nice motivator.
-Though it was very nerve-wracking to not know whether or not you were going to present.
-Felt somewhat unmotivating to do the problems when you did not have to present them.
-It is scary, but good, learned alot. However some students might be discuraged to participate in lack of confidence or lack of teammates for support, which is sad.
-I think they where very good! They made you solve problems with "exam-level accuracy". And in that way you really must think of every step.

Q: How can we improve the presentation sessions?
-Give more time per problem to the presentations and if that is not possible, maybe a seminar-style examination would be more educational.
-Maybe either give the students more, shorter, exercises, or that each group whould only present a part of the problem. Otherwise maybe specify which main results should be presented. I thought that it was a bit to stressful to try and present an entire problem during 20 minutes.
-It would be nice to get more feedback after presenting the problem.
-I think the ones who already have presented should not be able to be drawn again.
-Having a group to do the problem with seemed to be benefitial
-Let more people present.

Q: What is your overall opinion about the experimental lab in regards to your learning? (5 - very good, 1 - very bad).

4.17

Q: What can be improved about the labs? (Lab instructions,scheduling, should the labs be later in the course, information, supervision)? What should not be changed?

-The lab preparation was good for actually understanding zeeman effect but actually doing the lab was severly underwhelming
-Did not do the lab this year but the preparation problems were great last year and it has not changed so keep up the good work.
-All groups should have had similar experiences but the different Lab-instructors had different approaches.
-I think that the examination of the labs might have been unfair between the supervisors.
-Make sure that both the lab supervisors are on the same level about what is being tested. Some of us had to do a gauss approximation which other students did not have to do. Felt a little bit unfair.
-Labs where good, the preparation Pamflett was good, although the pictures in it was very low quality, especially the one on the experimental setup.
-I think Aitor did a really good job and the lab was fun and I learned a lot!
-I found it exciting, getting an opportunity to tackle problems and then apply their solutions physically is always a great experience, especially discussing the problems with the excplicit intent of trying one's interpretation and rectifying misunderstandings.
-It was mostly good. It was unclear though, whether we were required to do an error estimation. Some groups had to do gauss error approximation, while some groups didn't have to estimate the error at all. This can come across as unfair. Other than that the lab was good. Aitor really made the lab fun and made sure everyone was involved.
-The preperation for the zeemanlab was good. I learned a lot, since it was a LOT of preparing exercises. But the practical part wasn't very good.
-Some problems in the lab instructions where hard to solve and could not be found in the compendium.
-I think it was really good and have no opinions in what to improve it.

Q: What is your opinion of the book?

4.64

Q: Did the book inspire you to study other material (e.g other books, internet sources, etc)? In that case, which other materias did you study?

-Yes
-Looked at some youtube videos but the book was best suited.
-I used some youtube videos besides using the book.
-Not really.
-The book mentions some experiments which was interesting to look up on youtube.
-Wikipedia had some really good summaries on QM as a whole.
-No
-No not really
-A very good book
-Love the book
-Th book was really good and I had such a good time reading it. I also ao looked for information online and watched some videos on YouTube.
-No i just needed griffith.
-The book were verry good. It keppt the subject interesting even tho it was hard.
-no
-No opinion, don’t really read the literature except for the assignments
-Yes Griffith writes very good
-internet sources
-Nope

Q: What do you think about the recommended problems? Did they cover all the material? Should some problems be removed/added?

-Most problems were good
-I found it great that you added more problems and changed some of them to this years course to prevent us losing all too much of our time to algebras tedious ways.
-They were reasonable.
-Yes, I liked the recommended problems.
-They were good and covered pretty much everything I think.
-I liked the reccomended problems.
-I think the problems were good and they covered everything.
-They were good
-Excellent, the problems covered the chapter contents extremely well.
-The recommended problems where very good parallel with the lectures!
-I think they were good. Maybe add some problems on perturbation theory :)
-Overall I think they were a good representation

Q: Did you solve any additional problems except for the recommended problems (and problems from the old exams)?

13: Yes
40: No

Q: Please let us know if you have any additional comments about the course!
-In certain chapters we solved some problems that were not recommended because we felt the recommended ones were not what we had gone through in the lecture.
-Problems from other books
-Thank's for a great course! The video lectures were very interesting and well produced, Euardo must have put in quite some effort in making them! Very apreciated!
-Very good online lectures, was motivating and fun.
-Even though I do not think quantum mechanics is a field I want to persue in my carrier I really liked this course. Eduardos lectures and entusiasm, Aitors helpfulness and how the course were planned out was really great!!
-Just want to say that this course really exceeded my expectations and the lectures were really engaging.
-Note to Eduardo: You did an absolutely phenomenal job with the corona-adaptation of this course! … Thanks for a great course!
-Just want to tell you that this is the best teaching experience I have ever had! Very good explanation of the material we have been going through, incredible energy even though all the material was recorded.
-Fucking brilliant work champ Eduardo!
-I think that this course has been more fun than most of the previous courses. One reason for this is that you(Eduardo) and also Aitor are so enthusiastic while teaching which is so nice!! It makes it easier and more fun to learn which is great! :)
-Great course!!! Very interesting subject and Eduardo is such a great teacher!!
-Eduardo was a great teacher! Despite the lectures being prerecorded, they were fun and interesting.
-It was my favorite course in Umeå so far. Thanks a lot for the great and motivating lectures.
-Eduardo was great! Despite the fact the course was online, he made the course really interesting and fun. It was really nice that he put in the effort to edit his leactures! ++Eduardo Aitor was really good at the lab-supervision. He made the lab super interesting and explained things very well! ++Aitor
-Nice course with nice teachers! It was fun to see that things you learned in earlier courses could be found and used here.
-It was lovely
-This 6hp course + 6h electrodyn + TBV course is not at 105% speed, more like 180%. This is the hardest part of Teknisk Fysik so far! I studies around 60 to 70h per week, and was far behind anyway....

Lärarnas synpunkter på kursens innehåll och genomförande

I can see that the implementation of the course was ok, and although several parts need to be revised, the overall student experience was improved when compared to previous courses.

Förslag till nästa kurstillfälle - ange vem som ansvarar för förändringen

-Some later topics/chapters need more recommended problems
-Add recommended problems from different sources
-Improve problem solving sessions (engage students in the lecture)
-Adapt the presentation problems to allow time for discussion, and provide feedback to the students
-Improve details on the on-line lectures (board spacing, letter size,...)
-Be clear witht he aim of the lecture

Bör kursplanen ändras till nästa kurstillfälle - vem ansvarar i så fall för att förändringen görs?

No.

Granskn.

Granskare lärare (CAS-identitet)

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Granskare student (CAS-identitet)

masu0258 [Marcus Sundin]

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Eventuella kommentarer på granskningsprocessen