

Course analysis for "Quantum physics in research and society, FYSN21" HT 2020 and "Physics experiments in research and society, FYSN11" VT 2020

Due to heavy workload during spring 2020, mainly related to the COVID-19 situation, there was no evaluation of FYSN11 by the end of the spring term. Instead, a similar evaluation survey as composed for FYSN21 for the fall was sent out to the spring students as well. There were no significant changes between the two courses, except for name and course code, so the same questions were relevant. We got a bit less response, however, probably due to the late survey. The two evaluations are here analyzed together.

Course responsible: Johan Gustafson

Other teachers: Joakim Cederkäll, Torsten Åkesson, Robert Frost, Kim von Allmen

Number of students registered: Fall: 19, Spring: 19

Course representative: Fall: Daniel Magdalinski and Luca Bernecker, Spring: Jim Klintrup

Grades: Fall: U - 1, G - 2, VG - 16, Spring: U - 3, G - 7, VG - 9.

Analysis

I. Summary of the course evaluations

Total number of responses: Fall 9, Spring 6

Short summary of the results: Overall the students were very satisfied with the course. The survey started with two general questions about the results of the course:

To what extent do you think the following statements agree with your experience of the course?

1: Through this course, I have developed valuable knowledge/skills for my future studies and work life

2: I judge that I have reached all the learning goal of the course.

grade 1 = not at all, 3 satisfactory and 5 = very much

These questions got an average answer of 3.4 and 3.6 during fall and 4.5 and 4.3 during spring and none of the students gave a grade below satisfactory.

The students were especially satisfied with the training and lectures on written and oral presentations, taking responsibility for individual acquisition of knowledge, seminars and the proposal project.

The response for the **spring course** was generally more positive and none of the questions got an average grade below satisfactory. We have to consider the possibility that positive students are more willing to respond, but as far as we can see the spring course was very satisfactory. There were only two questions that were answered as unsatisfactory by one student:

To what extent do you think the following learning or training goals have been reached?

9: Find connections between different fields of physics.

One student gave grade 2 while the others gave grade 4 (3 students) or 5 (2 students)

13: Identify and formulate qualified questions and device how to solve them.

One student gave grade 2 while the others gave grade 3 (2 students), 4 (2 students) and 5 (1 student).

The response for the **fall course** was less positive, but still only two questions got average grades below satisfactory:

To what extent do you think the following statements agree with your experience of the course?

3: I think there was a clear thread through the course, from learning goals to examination.

Average grade 2.9, but rather evenly spread out with the grades 1-5 given by 1, 3, 2, 2 and 1 students, respectively.

5: How engaged did you feel throughout the course, as compared to other courses?

Average grade 2.8, with the grades 1-5 given by 2, 1, 4, 1 and 1 students, respectively.

Other questions or tasks that got unsatisfactory grades from more than one of the total 15 responding students, and correspondingly might need extra attention, are:

4: I recognise that the course has encouraged me to keep a scientific approach (that is analytical and critical thinking, independent search for and evaluation of information).

2 unsatisfied

To what extent do you think the following statements agree with your experience of the course?

12: Analyze and evaluate complex information even with limited information.

2 unsatisfied

13: Identify and formulate qualified questions and device how to solve them.

4 unsatisfied

16: Identify need for further knowledge.

2 unsatisfied

24: Research project and research paper

2 unsatisfied. Average grade dropped from 4.7 to 3.4 between spring and fall.

26: Proposal project, oral presentation

2 unsatisfied. Average grade dropped from 4.3 to 3.3 between spring and fall.

In addition to the evaluation the general course elements and outcomes, discussed above, the students were also asked to evaluate the communication, workload and the use of online teaching.

The communication was generally found satisfactory.

The workload was also in general satisfactory, with only one student reporting a workload of more than 25 h/week and two students reporting less than 10 h/week (out of which 1 student reported less than 5 h/week).

The view on online teaching varies with most of the students finding it as good as, or even better than normal, while a few students found it "not quite as good as normal" teaching. Only one student responded that the project work and seminars worked bad.

Finally there were only a few free text comments:

- I learned a lot from this course.
- It is complicated to write a proposal on the field that you are new to. Better to do a proposal on the base of the project. That would allow you to get used to the new field while doing the project.
- Seminars were not deep enough. It helped when the teachers talked too.
- Concept poster: Including the concepts was sometimes a bit difficult/felt a bit forced. Maybe there is another possibility? For example suggest more concepts and not all of them have to be used.
- Remote teaching: I think that this course was great because we did worked on the proposal and on the project together. That helped to know at least someone from the course. In other online courses now I feel completely alone.

II. **Comments and reflections from the teachers**

The teachers felt that the courses went well. We find it very positive that we have managed to turn the evaluations from demanding that the course is removed completely, about five years ago, to a situation where all the responding students were satisfied with the course, judging from the two general starting questions.

It is also pleasing that the course elements that have been positively evaluated in previous courses are still seen as positive.

There was a significant general drop in evaluation grades from spring to fall. We have identified two main reasons that we believe have caused this:

- In the spring the course was completely remote. During the fall, the covid situation was improved, and we planned to have most of the lectures and seminars on campus. As things developed, two of the three main teachers decided to minimize their IRL contact with people and their elements were moved online. This obviously worked well during spring, but as it was not as well planned for the fall, this is a likely reason for the general lower satisfaction with the fall course.
- The XRD project did not work well this semester, mainly due to broken equipment that meant that we had to change project in the last minute, and the new project was not very well suited. In addition, due to the covid situation, the teacher providing feedback on the research paper had to schedule a week of research experiments when the first version of the papers should be evaluated. This did not work well and the feedback got significantly delayed. This likely brought down the grade for the research project and paper, but also for the whole course, since this is one of the largest parts of the course.

The drop in evaluation grade for the proposal project is a bit more difficult to explain. The free text comment shows that at least one student would prefer to write a proposal about a topic that he/she has worked more with, for instance the research project. Although we see advantages with this idea, it is not in line with some major ideas with the project. Especially, two aims of the proposal

project is to quickly learn about a new topic within physics, and for all the students to learn about different research topics that are studied at the Department of Physics in Lund.

Taking a closer look at the elements that got a few negative grades, we interpret most of it as lack of information about the aim of the different course elements, in addition to the problems discussed above. Also, we recognize that the students have a responsibility to engage themselves in the course and, for students who spend less than 10 or even 5 h/week, we do not find it very surprising that the experienced engagement and learning outcomes are limited.

Although not well reflected in the survey, the teachers identified a problem with the concept posters, which according to the discussions in the lectures were not very clear and not seen as very relevant. We will change the topic of the posters until the next time the course is given.

III. Evaluation of changes since last time the course was given

The major difference from the course in the fall 2019 is the introduction of a poster instead of an essay to discuss the concepts. This was positively received, according to the evaluation, with only one unsatisfactory grade. One free-text comment found that it was a bit forced to include all concepts and oral comments during lectures gave a similar view. The main point with the concepts, however, is to realize that all of them are relevant for almost all fields of physics.

Another thought about the posters, however, is that basing it on the concepts as done this year, they become rather different from posters that are used in usual research conferences. Hence, they are maybe not the best way to train for poster presentations in the future.

Except for this, the course was given online, completely in the spring and partly in the fall. The evaluation shows that this works well, but needs to be planned properly.

IV. Suggestions for modifications and measures until the next time the course is given

There are two main topics in this course, (i) how physics is used in research and society and (ii) communication and other soft skills. We want both these topics to be clearly visible in the course, but the approach to the course may have important effects. Especially, the use of physics is very diverse, and it may be difficult to connect the different course elements with topic (i) as starting point. Taking topic (ii) as a starting point, it is natural to train different kinds of communication in different course elements, while topic (i) is more of a tool. Hence, we plan to present the course with focus on topic (ii) at the introduction meeting. We believe that there will not be very large differences in the course as such, but the connection between different course elements will be clearer.

We plan to introduce a workshop kind of lecture in paper writing, in addition to the main lecture on this topic. The idea is to prepare a short manuscript together, focusing on details such as making nice figures, describing them properly, what to

include in the different parts of the paper and other points that we have identified as problematic in previous courses.

For the next time the course is given, we will change the main topic of the poster such that it is more focused on each student's master specialization (or similar). The concepts should still be included, but could be discussed further orally during the peer review instead of being the main part of the poster.

Except for this, we will continue to work on the information about the different course elements in order to help the students to make the intended connections between the course contents and the learning goals. Also, we hope to have time to plan and prepare well-functioning research projects.

2021-02-17, this course analysis has been put together by Johan Gustafson, Torsten Åkesson, Joakim Cederkäll, Robert Frost, Jim Klintrup, Daniel Magdalinski and Luca Bernecker.

The course analysis is sent by e-mail to the director of studies: jan.knudsen@sljus.lu.se