

SK2758 – Solid state physics, 7.5 credits

Course analysis - Spring 2020, period 4

Course analysis performed by

Magnus Andersson, magnusan@kth.se (examiner and course leader)

Course design

The course consists of lectures, tutorials and laboratory work (with two labs – one on X-ray diffraction and the other on band-structure calculations). The course is examined through four quizzes in Canvas (TEN3), a normal written exam (TEN2) and a separate examination with written lab reports (LAB1). Due to the corona crisis which prohibited Campus education, the whole planning had to be changed on short notice. The lectures were instead transformed into pre-recorded videos, which were combined with three peer-instruction lectures during the course. The tutorials were handled through Zoom and whiteboard. The X-ray laboratory was solved by sending out experimental data to the students for analysis and the band structure laboratory was already a home lab. The written exam in the course (TEN2) was transformed into a home exam that tried to mimic the ordinary exam.

The planned course development for this year's course was the introduction of a special Ladok code (TEN3) for the quizzes in the course and writing down grading criteria. The quizzes cover the basic knowledge and skills in all parts of the course and creates a foundation for more advanced problem-solving skills that are examined in TEN2. They have worked well, although students complain that it is too hard to require that everything must correct on a quiz. More work that anticipated was done to summarize the lectures this year.

Student workload

The course has 7.5 hp (200 h) during period 4. In the course questionnaire, 7 students answered that they had studied considerably less than this (<140 h), 6 that they had studied about this time (140 h < study time < 260 h) and 3 students that they had studied considerably more than this (>260 h). Hence, the time spent on the course seems reasonable for most students, while a few students have to struggle very hard. However, the course requires an ability to learn a diverse material in a short period of time, which is usually not trained in earlier courses, which creates additional obstacles for some students.

Study results

The course had 36 newly registered students among which 30 were active in some way during the course this year (6 students didn't participate in any activity during the course). The results on the different parts of the course were as follows:

Ladok code	LAB1	TEN2	TEN3	Full course
Passed	27	18	27	17
Percentage	90 %	60 %	90 %	57 %

Associated to the course, there was also 30 re-registered students from the previous courses SK2750 and IM2601, among which 20 were active during the course.

Ladok code	LAB1	TEN2	TEN3	Full course
Passed	20	5	12	5
Percentage	100 %	25 %	60 %	25 %

The grades on TEN2 were distributed as follows among the students participating in the examination (all courses SK2758, SK2750 and IM2601):

A: 0 students

B: 3 students

C: 8 students

D: 4 students

E: 3 students

FX: 4 students

F: 19 students

All the FX students have by now passed the complementary work and received grade E on the course. It is mainly the students from earlier course rounds that keeps down the examination rate in the course.

Learning environment

The course was very different this year as compared to earlier years due to the corona crisis. In general, students seem to have been quite satisfied with the course as e.g. seen in the course questionnaire, where 13 out of 19 respondents were positive to recommend the course to other students, 4 were neutral and 2 were negative. 10 out of 19 considered the course to be better than an average course at KTH, 2 were neutral and 5 answered that it was slightly worse. Considering the circumstances, the learning environment has worked reasonably well, but both students and teachers state that they miss the social contact created during classroom hours and which is not really replaced by the digital aids we have today. Hence, the course has worked well.

Answers to open questions

The overall impression is that students in general are well satisfied with the course. The video lectures were appreciated by most students, although a few critical comments about not going deep enough into the theory came up. All course activities were appreciated. The course information was considered clear enough, although the information about the Zoom lectures could have been communicated in a better way. On the other hand, the weekly to-do-list for studying the course on distance was appreciated and suggested to be kept also when the course comes back to normal format.

The requirement of zero errors on the quizzes in order to pass them was considered to be too hard. However, they are supposed to test basic knowledge and skills in the course which all students should be able to handle. Reconsidering this for next year, will be the main future course development.

Digital home examination had to be developed without any previous references and it was chosen to do this as a home exam mimicking the ordinary exam. This required quite some development work, including individualization of exams, anonymization when correcting the exams and some rethinking on

how the exam questions were formulated to reduce the usefulness of using search engines when trying to solve the problems. As an example, there was a little bit more of analysing and explaining experimental data on the exam than usual. Although students were sitting in their own homes, the exam was considered as stressful, because of the following reasons:

- There was a short part A on the exam with a self-correcting quiz that had to be passed before the student could continue with the rest of the exam.
- There was a grade A question on the exam that had a quite early hand-in time.
- Potential grade A students were phoned during the exam for an oral check that they could explain their results obtained so far. This oral examination took too long time in some cases.

The last issue was afterwards resolved by slightly lowering the number of point required for higher grades. The self-correcting quiz for stopping students from continuing the exam is a good tool to identify grade F students already at an early stage during an exam – a student that does not pass such an examination has not acquired sufficient knowledge to pass the examination. However, the hand-in time for the grade A question was too short and less students than anticipated handed in at least something on this question. This need to be refined in the future. Besides this and a small error when setting up the Canvas quizzes, this type of home examination worked in fact quite well as a substitute for the standard written exam. It should also be mentioned that the possibility for students to hand in an incident report after the exam was appreciated, since it was promised that an honest incident report will not lead to any disciplinary actions, but may only affect the grading of the exam.

Prioritized course development

This year's course has worked quite well and due to the large effort made this year to develop course material for distance learning and the additional time spent on these activities, the next year's course development will mainly be to tune some of the learning activities created this year. This will mainly concern the video material and the grading of the quizzes. Much more will not be possible to do. For the re-examination in August, the phone-up time must be reduced and the hand-in time for the grade A problem should maybe also be reconsidered.