# Course analysis: SK2901 Quantum Materials and Devices, 7.5 hp, period 3, 2022

### *Course data*

| | | |
|---|---|---|
| Registered students: | 28 | |
| Teachers: | Ilya Sychugov, course responsible, 14 lectures | |
| | Ali Elshaari and Apurba Dev, 1 invited lecture each | |
| | Juan Carlos Rivera Hernandez, PhD student, 8 tutorials | |
| | Adil Baitenov, quantum dot lab | |
| | Fredrik Stridfeldt, quantized conductance lab | |
| Examination results: | | |
| TEN1, 2022-03-16 | 19 passed, 5 failed | 6.0 hp |
| TEN1, 2022-06-08 | 1 upgraded, 2 failed | 6.0 hp |
| LABs | 25 passed, 3 failed | 1.5 hp |
| Mini Project | 19 participated (not compulsory, bonus for exam) | 0 hp |
| Two control exams | 22 and 17 participated (not compulsory, bonus for exam) | 0 hp |
| Full course | 19 passed | |
| Overall examination | 68 % | |

### *General about this year's course*

This year the course was based on the same book, but the tutorial responsible person changed. The mini-projects and control exams were voluntary and could add up to 25% of the maximum exam score. Both lectures and tutorials were run in a hybrid mode (zoom/on site).

The number of students decreased slightly this year to 28 (2020: 36). Students were mostly from Nanotechnology program but also exchange students.

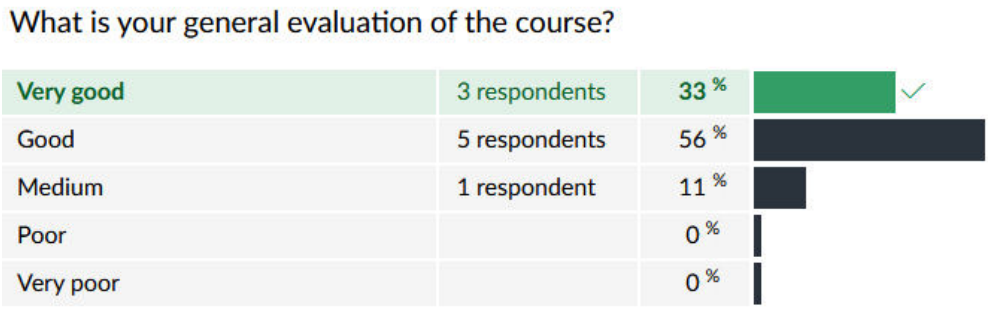
There was a guest lecture by Apurba Dev on biosensing and by Ali Elshaari on quantum photonics.

Approximately ~15-20 students on average followed tutorials and lectures. Seven tutorials (2 hours) consisted of the discussion/solution exercises taken from the course book with additional exercises given as homework. Some tutorial consisted of the solution of exercises from previous exams.

There were 2 labs: (i) Quantum dots and (ii) Quantized conductance. Lab reports were corrected.

### *Student evaluation*

A student evaluation using Canvas was performed. About half of the examined students answered (9/24) and the general evaluation was positive:




Examples of responses are given here for each question:

- Main impression. Positive: “interesting quantum physics and application in devices, one of the best courses taken, manageable difficulty”. Negative: “struggled with theory, hard to follow, insufficient previous math/physics”
- Text book and course material. Positive: “understandable, complement lectures well (3), adequate”. Negative: “too advanced, hard to read (2), last chapters difficult, takes time to read”
- Lectures. Positive: “very good (4), nice with the blackboard (2), good pace”. Negative: “more visual aid for better understanding of theory could be better, more clear theory explanation”
- Tutorials: Positive: “helpful, good” Negative: “not good (3), use normal format: explain related theory and solve problems (3), chapter 6 questions are disconnected from the lecture, sometimes just 2 exercises in 2 hours”
- Labs: Positive: “interesting (5) and useful, cool to see quantum phenomena in real life, helpful instructors”
- Control exams. Positive: “helpful, useful for preparation to exam, makes me to study step-by-step”. Negative: “arrange one more for the last two chapters”
- Exam. Positive: “good, manageable, right level”. Negative: “too difficult compared to previous years, poorly conducted – some people used books for theory part (2), last questions difficult”
- Mini project useful: “Yes (7)” “Did not participate (2)”
- Further comments: “upload all invited lectures (there is only one from Biosensing lecture)”

### *Changes to next year*

It was first year for the new tutorial assistant, so some criticism about problem-solving exercises both on content and execution need to be addressed for the next year. There was also a confusion about the exam, where some student probably read from last year (pandemic) instructions about the use of the book (for remote exam), and proctors did not follow relevant instructions properly. Pandemic year exam example will be removed to avoid confusion, and more clear guidelines to proctors given to avoid repetition of this issue. Individual comments as stated above will be considered.

### *Summary/Conclusion*

This year the course had ~25 students. About half of examined students got A/B grades, which is a good performance. In general the course seems to be well appreciated, but it is considered as hard for students without proper physics background. At the same time for those with strong background in solid state physics, quantum mechanics, etc. introductory lectures are not so interesting. So it is not easy to keep the difficulty level balanced for the whole group. Theory explanation can be improved to bring all students to a similar level.

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