



LUND UNIVERSITY
Faculty of Science

Centre for Mathematical Sciences
Division of Mathematics and Numerical
Analysis

Course Analysis for NUMA01 Computational Programming with Python, Autumn 2023

Course Information

Lecturer: Robert Klöfkorn, Malin Christersson

Teaching assistants: Paulina Ibek, Otto Larsson, Valentina Schüller, Abdulla Shahin,
Erik Troedsson

Number of students:

95 newly registered and 9 re-registered.

43 students answered the course evaluation, 19 of them are enrolled on Bachelor's programme in Physics and 22 on Bachelor's programme in Mathematics.

Examination

Project: 85 students passed.

Final grades:

In all, 85 students, including 2 re-registered students, have got their final grade.

Course Evaluation

Summary of student's answers:

Overall 43 of 104 students registered in the course answered the evaluation, of which 19 belonged to the Physics program, 22 to the Mathematics program, one student from another Swedish university and one exchange student.

Overall the course is well received and in particular the final projects are popular among the students. Between the two large groups taking the course, the students from the Physics program seem to be happiest with the course (most positive answers compared to other groups in almost all questions), followed by the students from the Mathematics program. A vast majority of the students that answered the survey felt that they learned programming and can manage to write programs in mathematics and physics or made their first steps and got motivated to dive deeper into the subject. This is a very good result for an introductory course where roughly 50% of the participants have never programmed before. The vast majority also likes that the training exercises are on the same day as the lectures and an overwhelming majority was very satisfied with the teaching assistants. As observed previously, a large group of students never or rarely consult the course book, which will be addressed in upcoming instances of the course. Nevertheless, as always, a small minority is unhappy with the course, for example, some students (2 out of 43) commented that for beginners the learning curve is very steep. The teachers of the course are very well aware of this (see comments below).

Another student feels unprepared for a career in physics that involves programming (contrary to all answers from Physics students in the relevant questions) and yet another student mentioned that mathematical knowledge is used that hadn't been discussed in other courses, which might be the case in one or two training exercises (see comments below). Yet a third student wishes to for a written exam rather than oral presentations (see comments below).

Teachers' comments:

The course was given as “on campus” with a presentation of the material during the lecture and a follow-up training exercise to work with the topic of the day. The lecture material is provided as pdf, jupyter notebook and Python file. The material closely follows the course book “Scientific Computing with Python” by Claus Führer et al.

The students have to orally present two homework assignments and one final project in order to pass the course. The participation in the lectures was about 60% (both survey and teachers count during lectures) and for the training exercises about 40%, for those who answered in both cases.

Changes from the previous course realization:

Compared to the previous realizations only small changes have been made, adding some training exercises and some minor changes to various lectures. The use of the course book is still below expectation.

Suggestions for the next course realization:

For the next course realizations various changes have already been implemented. Among those are:

- The training exercises are now compulsory for all participants of the course. The teachers agree that this part of the course is most important for the students, especially for those that have never programmed before.
- Training exercises will involve the course book more often to clearly demonstrate its use to the students. It will be made very clear to the students that their first option for finding answers to questions about the course material should be the course book and not the internet or various AI based chat bots.
- The training will be extended by both easier **warming-up** exercises as well as more difficult **voluntary** exercises for those that have programmed before and are seeking some extra challenges.
- Pandas will be moved forward within reason (one or two lectures) and an outlook to 3D plotting and animation techniques will be included (upon request from Physics students).
- Additional final projects, especially physics related projects, will be included.
- All training exercises mentioning eigenvalues have been clearly marked as **voluntary** or have been removed.
- It will be mandatory for all students to provide a written statement about their contribution to the project work as well as to what extent generative AI has been used.
- And lastly, a compulsory quiz testing the students knowledge of Python will be introduced. However, the overall oral presentations will remain unchanged.

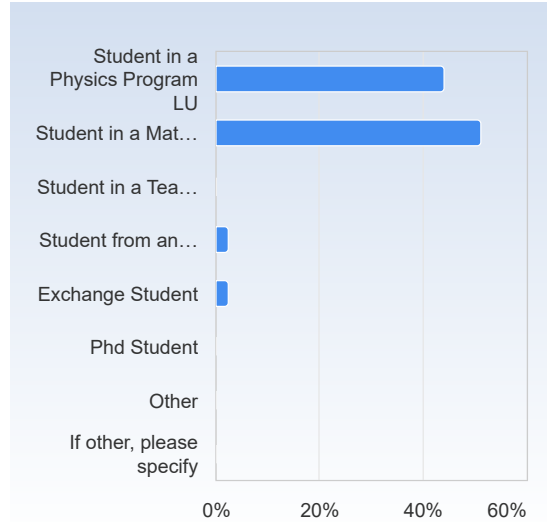
The teachers will carefully monitor the impact of these changes before new modifications are to be added to the course.

Computational Programming with Python, Autumn 2023

Respondents: 104
 Answer Count: 43
 Answer Frequency: 41.35%

Your role in the course?

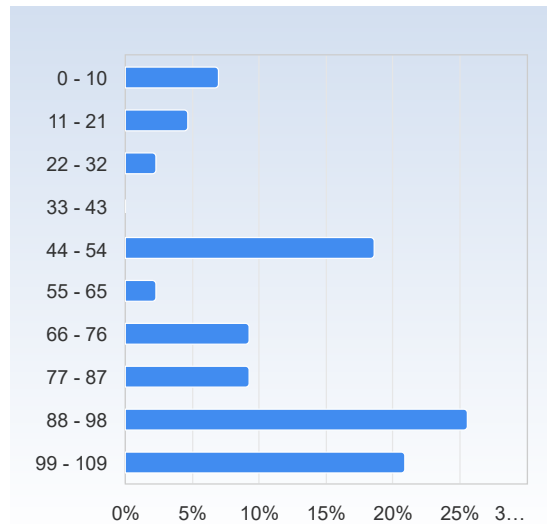
Your role in the course?	Number of responses
Student in a Physics Program LU	19 (44.2%)
Student in a Mathematics Program LU	22 (51.2%)
Student in a Teacher's Program LU	0 (0.0%)
Student from another Swedish university	1 (2.3%)
Exchange Student	1 (2.3%)
Phd Student	0 (0.0%)
Other	0 (0.0%)
If other, please specify	0 (0.0%)
Total	43 (100.0%)



Your role in the course?	Mean	Standard Deviation
Your role in the course?	1.7	0.8

Your participation in the lectures.

Your participation in the lectures.	Number of responses
0 - 10	3 (7.0%)
11 - 21	2 (4.7%)
22 - 32	1 (2.3%)
33 - 43	0 (0.0%)
44 - 54	8 (18.6%)
55 - 65	1 (2.3%)
66 - 76	4 (9.3%)
77 - 87	4 (9.3%)
88 - 98	11 (25.6%)
99 - 109	9 (20.9%)
Total	43 (100.0%)



Your participation in the lectures.	Mean	Standard Deviation
Your participation in the lectures.	70.5	29.4

Comment

I skipped some lectures as the material was already known to me.

In other courses I always go to every lecture, but in this course I found reading the slides and practicing on my own more beneficial most of the time as the lectures had a lot of information and not enough time to really internalize anything.

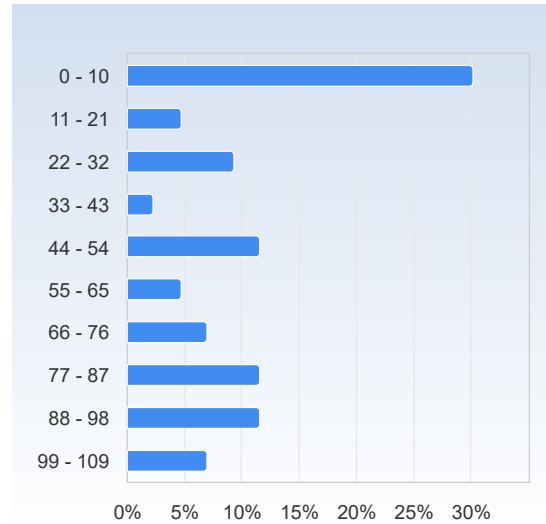
I went to the lectures that went through material I was not completely sure about.

For beginners not helpful.

I have been programming for 8 years before, so I already know it

Your participation in the training exercises.

Your participation in the training exercises.	Number of responses
0 - 10	13 (30.2%)
11 - 21	2 (4.7%)
22 - 32	4 (9.3%)
33 - 43	1 (2.3%)
44 - 54	5 (11.6%)
55 - 65	2 (4.7%)
66 - 76	3 (7.0%)
77 - 87	5 (11.6%)
88 - 98	5 (11.6%)
99 - 109	3 (7.0%)
Total	43 (100.0%)



	Mean	Standard Deviation
Your participation in the training exercises.	47.0	35.3

Comment

I didn't need in most situations.

Went to a couple lectures as I always do the training prior to the class.

I didn't go to the rooms often but I did all of the training exercises with the exception of one.

I didn't feel they were necessary unless I had a particular question.

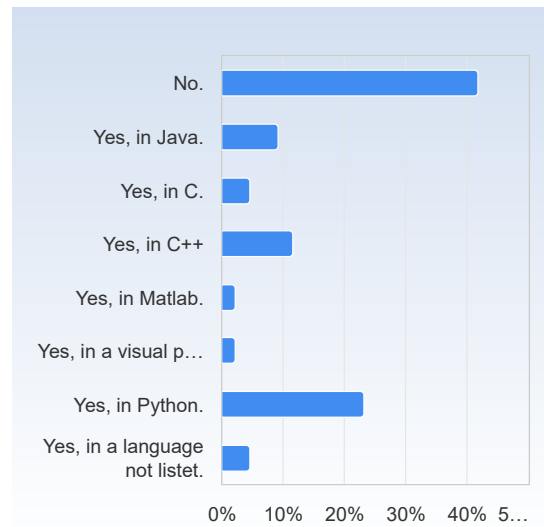
Only helpful if you know someone that is better than you at programming. Tutors are not really helpful, sadly.

Same as above

I just focus better at home

Have you ever have written a computer program before the course start? (Please give the most relevant answer)

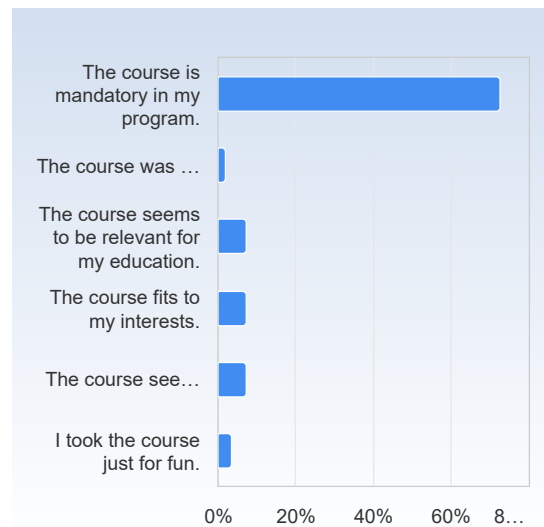
Have you ever have written a computer program before the course start? (Please give the most relevant answer)	Number of responses
No.	18 (41.9%)
Yes, in Java.	4 (9.3%)
Yes, in C.	2 (4.7%)
Yes, in C++	5 (11.6%)
Yes, in Matlab.	1 (2.3%)
Yes, in a visual programming language, like Snap! .	1 (2.3%)
Yes, in Python.	10 (23.3%)
Yes, in a language not listet.	2 (4.7%)
Total	43 (100.0%)



	Mean	Standard Deviation
Have you ever have written a computer program before the course start? (Please give the most relevant answer)	3.5	2.6

Why did you sign up for the course? (several answers possible)

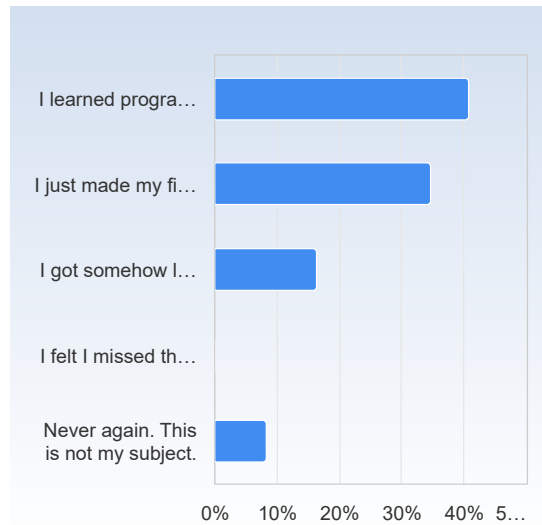
Why did you sign up for the course? (several answers possible)	Number of responses
The course is mandatory in my program.	40 (93.0%)
The course was strongly recommended in my program.	1 (2.3%)
The course seems to be relevant for my education.	4 (9.3%)
The course fits to my interests.	4 (9.3%)
The course seems to improve my chances on the work market.	4 (9.3%)
I took the course just for fun.	2 (4.7%)
Total	55 (127.9%)



	Mean	Standard Deviation
Why did you sign up for the course? (several answers possible)	1.9	1.5

Now that the lectures are done, my impression is.....

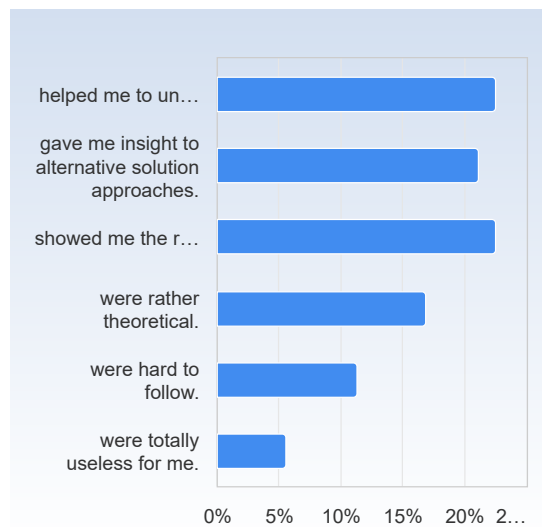
Now that the lectures are done, my impression is.....	Number of responses
I learned programming and I feel that can manage to write programs in mathematics and physics.	20 (46.5%)
I just made my first steps and got motivated to dive deeper into the subject.	17 (39.5%)
I got somehow lost during the course, but I think I will catch up.	8 (18.6%)
I felt I missed the point with this course and will retake it.	0 (0.0%)
Never again. This is not my subject.	4 (9.3%)
Total	49 (114.0%)



	Mean	Standard Deviation
Now that the lectures are done, my impression is.....	2.0	1.2

The lectures

The lectures	Number of responses
helped me to understand concepts and details.	16 (37.2%)
gave me insight to alternative solution approaches.	15 (34.9%)
showed me the relevance of programming in mathematics /physics.	16 (37.2%)
were rather theoretical.	12 (27.9%)
were hard to follow.	8 (18.6%)
were totally useless for me.	4 (9.3%)
Total	71 (165.1%)



	Mean	Standard Deviation
The lectures	2.9	1.5

Comment

I felt like majority of lectures was just throwing theory which, in many cases, I won't use

The entire programme is missing a clear and concise structure, the content of the lectures seems random and not related to the final projects in many parts. The style of the teaching is greatly improvable.

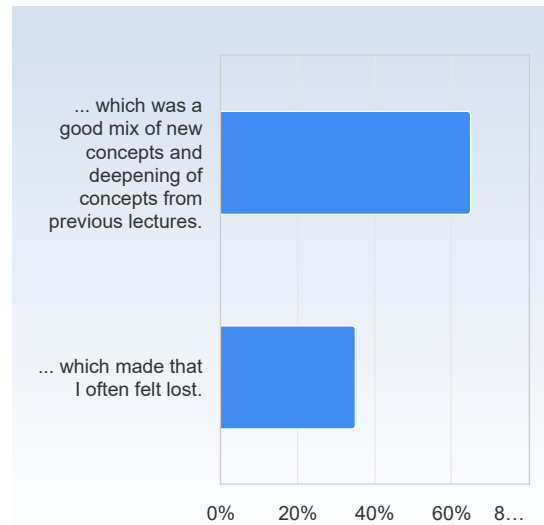
The lectures were sometimes helpful but I had some background. Had I no background I think I would've been totally lost.

Some lectures were good and clear, but sometimes went on a tangent about seemingly random stuff that was very hard to follow and devotivating, difficulty varied greatly and understanding in the lectures did not translate into practical application: the exercises felt very hard.

True for the later part of the course. My impression is that the course isn't meant to spend much time on the basics of programming but introducing one way of using it (for mathematical computations). In that sense lectures were hard to follow in the beginning and didn't make much sense for me, but after doing reading on my own they became useful and insightful.

The material used during lectures was ordered in a way ...

The material used during lectures was ordered in a way ...	Number of responses
... which was a good mix of new concepts and deepening of concepts from previous lectures.	26 (65.0%)
... which made that I often felt lost.	14 (35.0%)
Total	40 (100.0%)



	Mean	Standard Deviation
The material used during lectures was ordered in a way ...	1.4	0.5

Comment

Nice that code from previous assignments was discussed but often many did not know these parts of the code and so this part of the lectures often seemed like it was oriented only to a very small portion of the class.

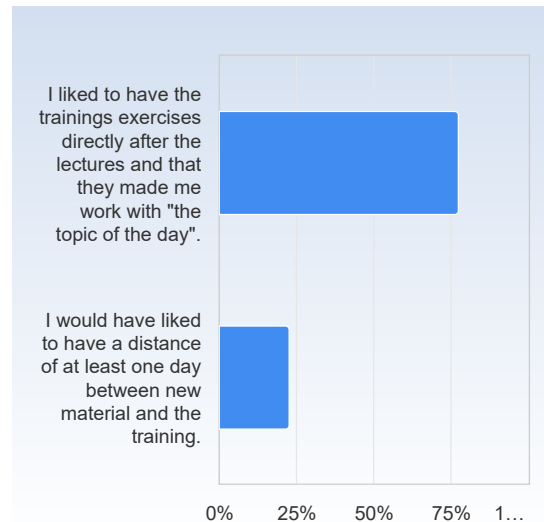
However as I've never programmed before sometimes it felt like we went through material a bit too fast for me without enough explanation of the basics. It would have helped me a lot if the lecture notes could have been released a few days before so I would have time to read them before the actual lecture and/or if the relevant pages in the book were given to us to read before the lecture. Especially as I've never programmed before I always felt like I was one step behind during the lectures.

I was familiar with a lot of the course material beforehand so I could often follow along, but there was often a large volume of new material per lecture.

Same as before the course structure seemed random at times and touched upon too many topics which confused me.

Trainings Exercises

Trainings Exercises	Number of responses
I liked to have the trainings exercises directly after the lectures and that they made me work with "the topic of the day".	24 (77.4%)
I would have liked to have a distance of at least one day between new material and the training.	7 (22.6%)
Total	31 (100.0%)



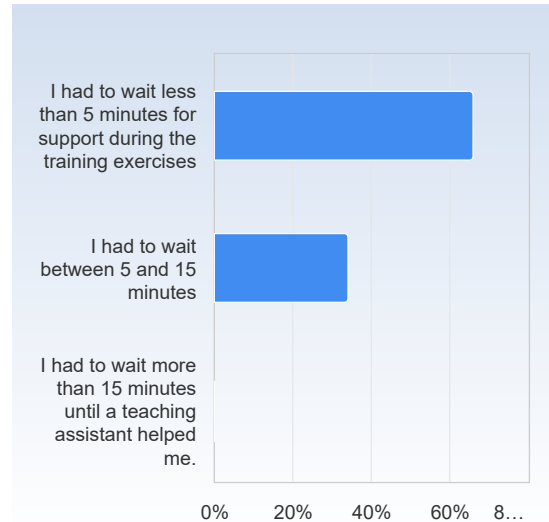
	Mean	Standard Deviation
Trainings Exercises	1.2	0.4

Comment

Sometimes exercises required mathematical knowledge that hadn't been discussed in other courses like Mata21 and 22
I needed time. But I think for students with prior programming experience it was probably nice.
The training exercises were my main way of learning new concepts so I really appreciated them.
Training exercises were good and helped with better understanding, however the exercises often felt very hard and frustrating even with knowledge from lectures. More easy exercises to deepen understanding would have been great.
I wished we had more of a guideline what is right or wrong, since without any answers its really hard to actually learn something there.
It was a bit hard to have "efficient study time" during the exercise classes, but I appreciate that they give the opportunity to interact with TA's and ask questions.
Just focus better at home

Support

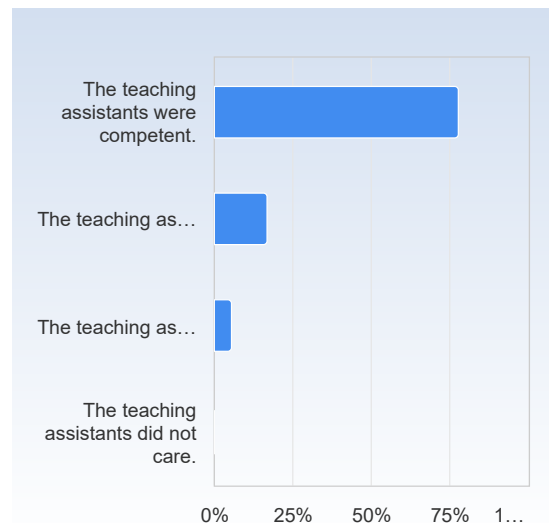
Support	Number of responses
I had to wait less than 5 minutes for support during the training exercises	25 (65.8%)
I had to wait between 5 and 15 minutes	13 (34.2%)
I had to wait more than 15 minutes until a teaching assistant helped me.	0 (0.0%)
Total	38 (100.0%)



	Mean	Standard Deviation
Support	1.3	0.5

Competence

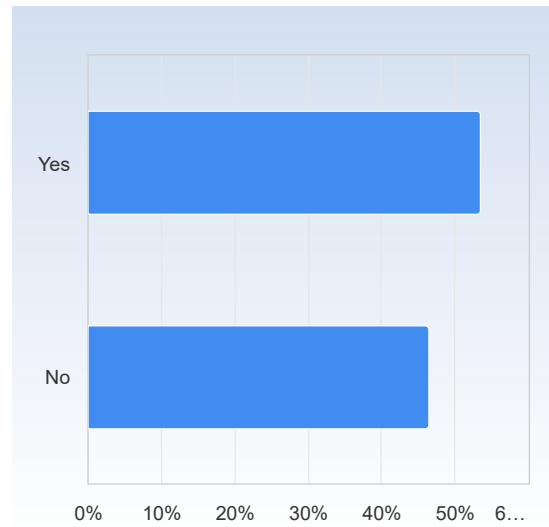
Competence	Number of responses
The teaching assistants were competent.	28 (77.8%)
The teaching assistant sometimes could not answer but found another one to help.	6 (16.7%)
The teaching assistants tried there best but gave me often wrong answers.	2 (5.6%)
The teaching assistants did not care.	0 (0.0%)
Total	36 (100.0%)



	Mean	Standard Deviation
Competence	1.3	0.6

Taining exercises. I worked in a group.

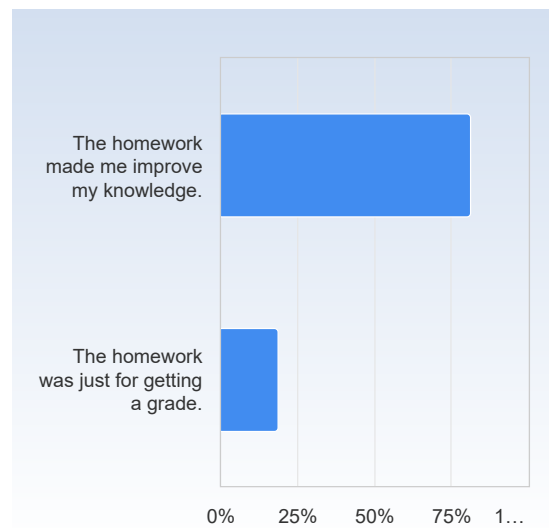
Taining exercises. I worked in a group.	Number of responses
Yes	23 (53.5%)
No	20 (46.5%)
Total	43 (100.0%)



	Mean	Standard Deviation
Taining exercises. I worked in a group.	1.5	0.5

Homework

Homework	Number of responses
The homework made me improve my knowledge.	35 (81.4%)
The homework was just for getting a grade.	8 (18.6%)
Total	43 (100.0%)



	Mean	Standard Deviation
Homework	1.2	0.4

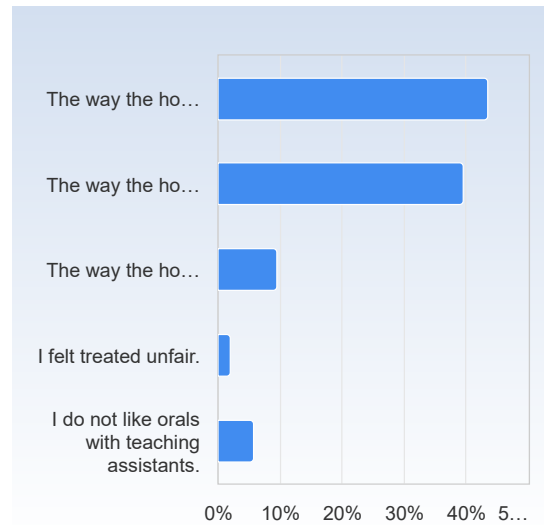
Comment

The homework was a great learning experience and groupwork experience. During this class I have to say I learned as much from classmates as I learned from the lectures and the TAs.

Completing the two homework assignments were definitely a fun part of course.

The homework presentations.

The homework presentations.	Number of responses
The way the homeworks were presented gave me a chance to get extra feedback.	23 (56.1%)
The way the homeworks were presented gave me a chance to show and test my knowledge.	21 (51.2%)
The way the homework was presented did not match to my effort I put into this work.	5 (12.2%)
I felt treated unfair.	1 (2.4%)
I do not like orals with teaching assistants.	3 (7.3%)
Total	53 (129.3%)



	Mean	Standard Deviation
The homework presentations.	1.9	1.1

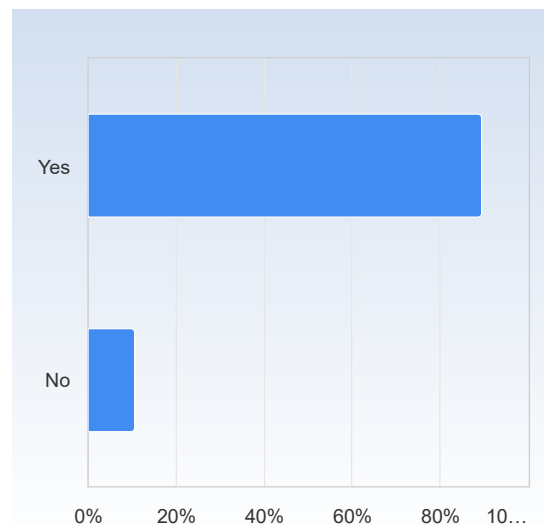
Comment

The teaching assistants were great! They were really encouraging during presentations and gave us a chance to expand our knowledge. They were also really great at making me feel like even if I got a technical term wrong/ didn't give the most precise explanation they would help me build on my answer and refine it. It was a great encouraging and learning experience.

A little too close to the analysis in one variable exam. Would be nice if there's a week gap to prepare the presentation.

I found it helpful to work in groups for the homework

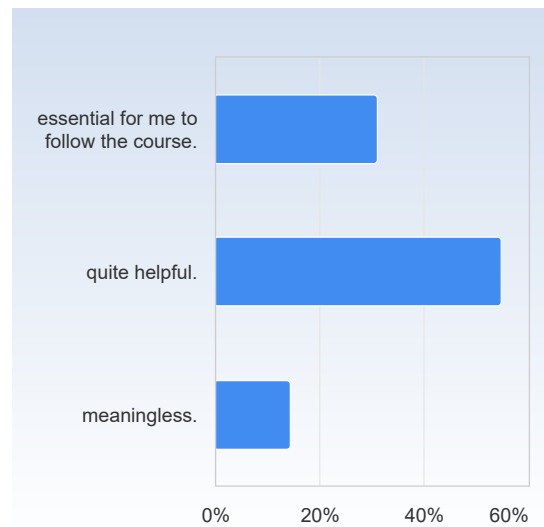
I found it helpful to work in groups for the homework	Number of responses
Yes	34 (89.5%)
No	4 (10.5%)
Total	38 (100.0%)



	Mean	Standard Deviation
I found it helpful to work in groups for the homework	1.1	0.3

Course material. The slides and Jupyter Notebook files were ...

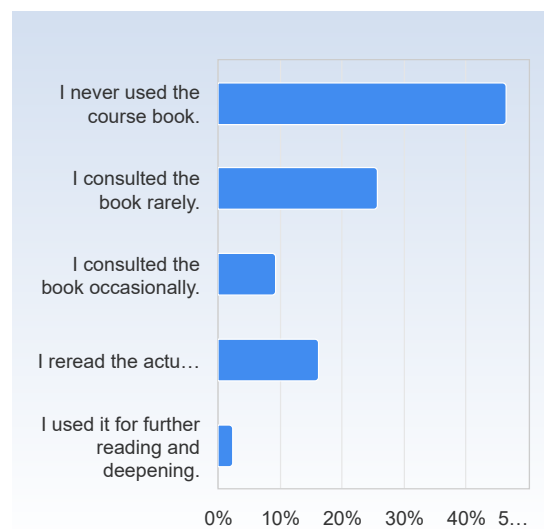
Course material. The slides and Jupyter Notebook files were ...	Number of responses
essential for me to follow the course.	13 (31.0%)
quite helpful.	23 (54.8%)
meaningless.	6 (14.3%)
Total	42 (100.0%)



	Mean	Standard Deviation
Course material. The slides and Jupyter Notebook files were ...	1.8	0.7

The course book.

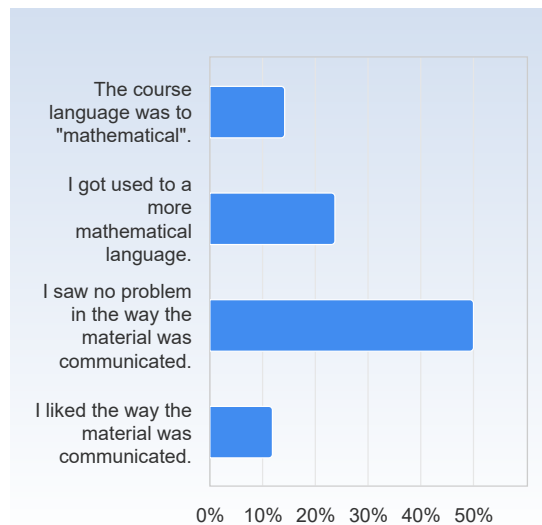
The course book.	Number of responses
I never used the course book.	20 (46.5%)
I consulted the book rarely.	11 (25.6%)
I consulted the book occasionally.	4 (9.3%)
I reread the actual sections of the lecture in the course book.	7 (16.3%)
I used it for further reading and deepening.	1 (2.3%)
Total	43 (100.0%)



	Mean	Standard Deviation
The course book.	2.0	1.2

Course style. Language

Course style. Language	Number of responses
The course language was to "mathematical".	6 (14.3%)
I got used to a more mathematical language.	10 (23.8%)
I saw no problem in the way the material was communicated.	21 (50.0%)
I liked the way the material was communicated.	5 (11.9%)
Total	42 (100.0%)



	Mean	Standard Deviation
Course style. Language	2.6	0.9

Here you can give final and summarizing comments, if you like

Here you can give final and summarizing comments, if you like

Overall, helpful. However if I were to change one thing, I'd like the course to focus more on 'numerical' part - more pandas, less time complexity, etc.

The teaching of the course was lacking the presentation of the lectures often seemed emotionless and didn't motivate to study the course. The topics of the lectures seemed not connected and not oriented to students of physics. After successfully completing this course I do not feel prepared for a career in physics that involves programming.

My only final comment is Robert is not the most encouraging teacher for beginners. Malin and the teaching assistants were great and really made me feel able to ask questions and learn through making mistakes. The way Robert teaches the lectures feels very aimed at only the group of the class that has programmed before. He can also be very dismissive of questions - telling people who ask to figure it out themselves. I would have appreciated it if the lectures took a bit more of a middle ground. I was very lucky that my class was so nice. Often some of my classmates who have programmed before would explain more thoroughly the stuff we went through in the lectures to me. The teachings assistants were also absolutely great. Otto and Valentina were very patient and willing to help everyone of all levels of coding knowledge. I had even read the book in the summer before the course to try and get a better start at Python but the lectures were too fast. Malin's introduction classes were great.

I liked the course overall, the final project is the most exciting part!

I mostly enjoyed the course. The homework and especially the final project were fun and challenging and I would like to take more programming courses in the future. My main complaint is that the lectures were often so oversaturated with slides with information that there was really no way for us to retain all of the information. I thankfully had some programming knowledge beforehand to guide me, but some of my friends were not so fortunate. Perhaps this is simply the way programming has to be taught as it is a steep learning curve and a lot of information, but maybe there could be some sort of optional mini-course alongside the revision course before the semester starts for those students with zero programming knowledge to be able to keep up.

An exam would have been better to test everyone's coding skills and knowledge they gained during the course. One of the reason is because not every group members tries to contribute to the final project.

For me as a complete beginner it was good to get some basic knowledge in python and I feel like i can build upon this. Nevertheless the lectures and the general structure of the course felt often demoralising as there seemed to be no clear guideline, it was more like switching between random topics which felt very complicated and useless on this level.

The lecturer is clearly very capable but sometimes makes things confusing. I think it might be a thing of programming and not the teaching method. However, I would have liked a more visual representation of how different methods and parts of the program interact with each other

The structure of the course is really poor. I was looking forward to learn programming, however this course is not suitable if you don't have prior knowlegde. In addition due to its organisational problems, it was a bad choice for an exchange student. Overall I did learn some programming, but more from my peers and the internet than in this course. Maybe they should pair up people with prior knowlege and newbies for a more inclusive course, or just make python knowlege mandatory.

Sometimes the answers of the teacher were not extremely helpful and discouraged asking questions. He alway said „any questions?“ and when you asked you mostly got the answer „just write a little program yourself“. I think it was meant in a way to encourage us solving problems on our owns, but then, why should I even ask a question? I liked his teaching style in general, just not this part.

Overall, I felt like I could make good use of the course. I had some experience with programming from a couple of years back so it helped me overcome my initial struggles to comprehend and follow the course material. Teaching could have been a bit more pedagogical at times during lectures. The first lectures are important since they can establish a comfortable introduction to the course for new programmers. Lastly, the course book was great. I think it provided a lot of relevant information to the tasks/assignments we were doing. It can be a bit hard to sort information and find the answers you want just searching the internet.