LUND UNIVERSITY
Faculty of Science

Centre for Mathematical Sciences
Division of Mathematics and Numerical Analysis

Course Analysis for MATB22 Linear Algebra 2, Spring 2024

Course Information

Lecturer: Anitha Thillaisundaram
Teaching assistants: Jan Henrik Thomm and Thomas Munn
Number of students:
44 newly registered and 21 re-registered.
14 students answered the course evaluation, all of them are enrolled on programme name.

Examination

Written examination: 32 students passed.

- Ordinary examination 13/03 2024: 44 students participated and 27 of them passed.
- Resit examination 13/04 2024: 21 students participated and 5 of them passed.

Final grades:
In all, 32 students, including 5 re-registered students, have got their final grade.
16 passed with distinction.
16 passed.

Course Evaluation

Summary of student's answers:
See above.

Teachers' comments:
This course was given jointly for science and teacher students, with respective course codes MATB22 and ÄMAD02. The lectures and seminars were held on campus. The lecture notes were uploaded on Canvas. For each seminar, a given list of exercises were to be discussed. The participation in the lectures and seminars were good. The examination was carried out on campus.

Changes from the previous course realisation:
Slightly less material was covered during the lectures, with slightly more independent study expected of the students.

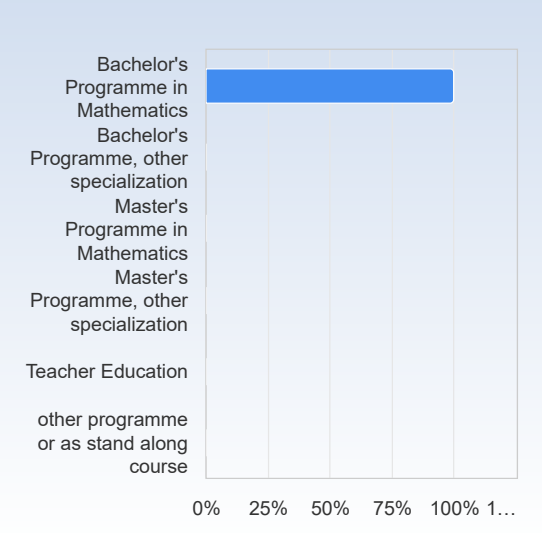
Suggestions for the next course realisation:
The amount of material covered during the lectures could be further slightly reduced, but it should be made clearer (in writing) that results and parts of proofs that are not covered during the lectures were planned to be so, and that this is done only for parts that repeat ideas seen before. This self-study aspect of the course provides important training in understanding the theory better, and it was not meant that we go through everything in the lectures. If there is no time to cover alternative geometric interpretations, a specific reference to a part of a book can be instead included in the lecture notes. Lastly, for the more difficult parts of the lectures, the students will be reminded to prepare by reading the relevant parts of the course book in advance.

Linear Algebra 2 Spring 2024

Answer Count: 14

I have studied this course as part of

I have studied this course as part of	Number of responses
Bachelor's Programme in Mathematics	14 (100.0%)
Bachelor's Programme, other specialization	0 (0.0%)
Master's Programme in Mathematics	0 (0.0%)
Master's Programme, other specialization	0 (0.0%)
Teacher Education	0 (0.0%)
other programme or as stand along course	0 (0.0%)
Total	14 (100.0%)



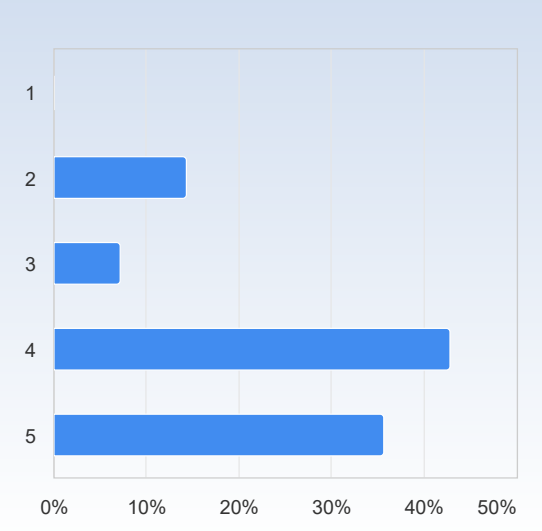
	Mean	Standard Deviation
I have studied this course as part of	1.0	0.0

The course in general

On a scale 1-5 select the option that best matches your opinion:1= disagree completely → 3= partly agree → 5= agree completely

My prior knowledge has been sufficient to assimilate the contents of this course.

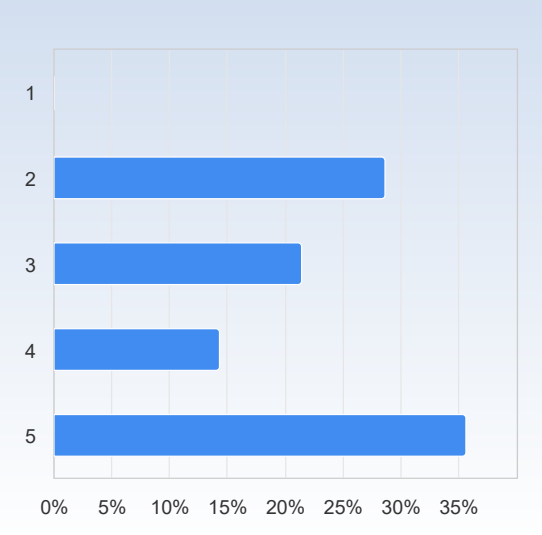
My prior knowledge has been sufficient to assimilate the contents of this course.	Number of responses
1	0 (0.0%)
2	2 (14.3%)
3	1 (7.1%)
4	6 (42.9%)
5	5 (35.7%)
Total	14 (100.0%)



	Mean	Standard Deviation
My prior knowledge has been sufficient to assimilate the contents of this course.	4.0	1.0

The way the course was taught and organised suited me.

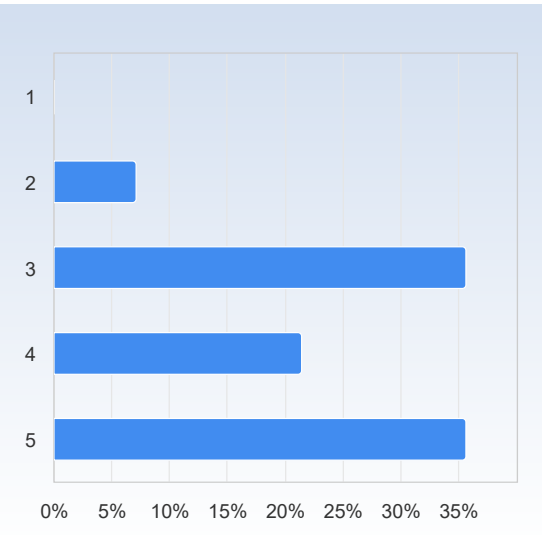
The way the course was taught and organised suited me.	Number of responses
1	0 (0.0%)
2	4 (28.6%)
3	3 (21.4%)
4	2 (14.3%)
5	5 (35.7%)
Total	14 (100.0%)



	Mean	Standard Deviation
The way the course was taught and organised suited me.	3.6	1.3

The number of teacher lead activities (lectures, seminars etc.) has been satisfactory.

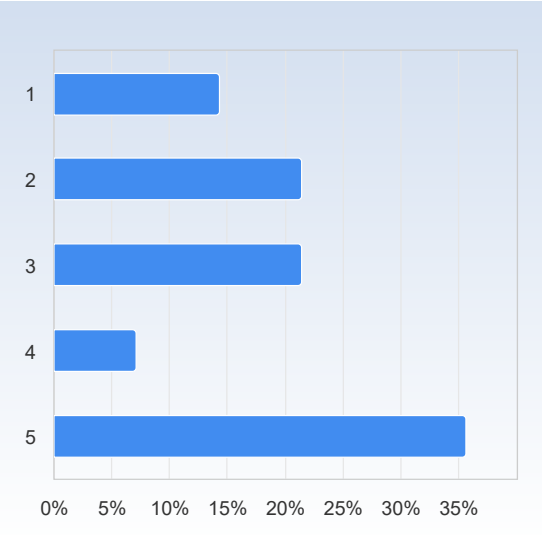
The number of teacher lead activities (lectures, seminars etc.) has been satisfactory.	Number of responses
1	0 (0.0%)
2	1 (7.1%)
3	5 (35.7%)
4	3 (21.4%)
5	5 (35.7%)
Total	14 (100.0%)



	Mean	Standard Deviation
The number of teacher lead activities (lectures, seminars etc.) has been satisfactory.	3.9	1.0

The lectures were valuable for my learning.

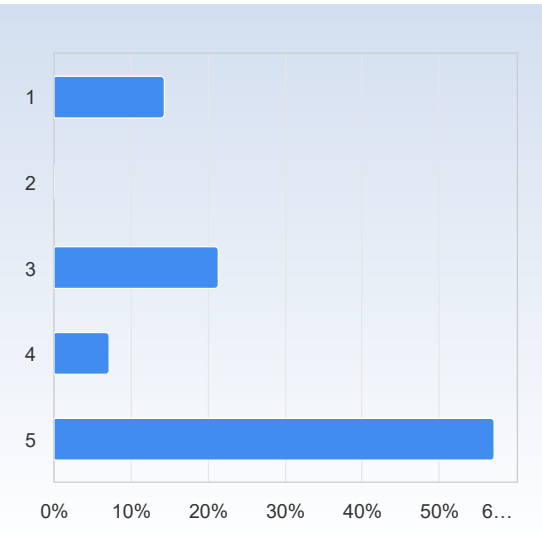
The lectures were valuable for my learning.	Number of responses
1	2 (14.3%)
2	3 (21.4%)
3	3 (21.4%)
4	1 (7.1%)
5	5 (35.7%)
Total	14 (100.0%)



	Mean	Standard Deviation
The lectures were valuable for my learning.	3.3	1.5

The seminars were valuable for my learning.

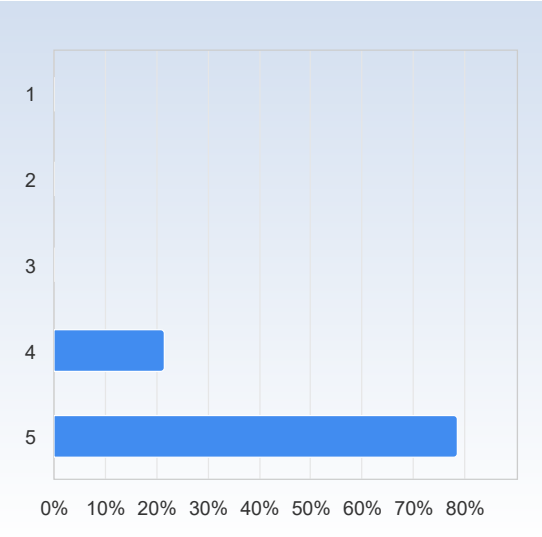
The seminars were valuable for my learning.	Number of responses
1	2 (14.3%)
2	0 (0.0%)
3	3 (21.4%)
4	1 (7.1%)
5	8 (57.1%)
Total	14 (100.0%)



	Mean	Standard Deviation
The seminars were valuable for my learning.	3.9	1.5

Studying on my own was valuable for my learning.

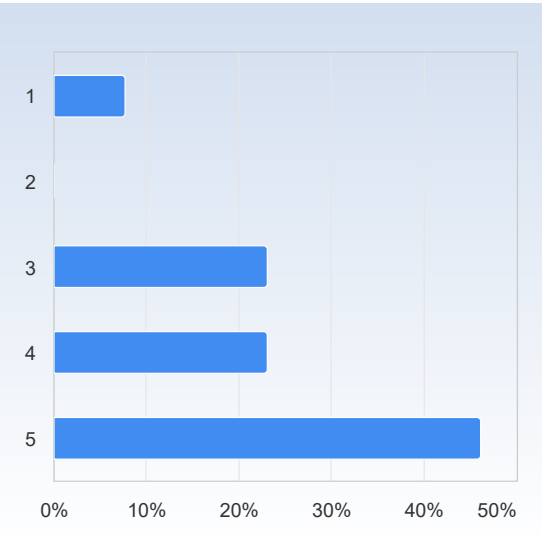
Studying on my own was valuable for my learning.	Number of responses
1	0 (0.0%)
2	0 (0.0%)
3	0 (0.0%)
4	3 (21.4%)
5	11 (78.6%)
Total	14 (100.0%)



	Mean	Standard Deviation
Studying on my own was valuable for my learning.	4.8	0.4

The course literature/material was a valuable learning resource.

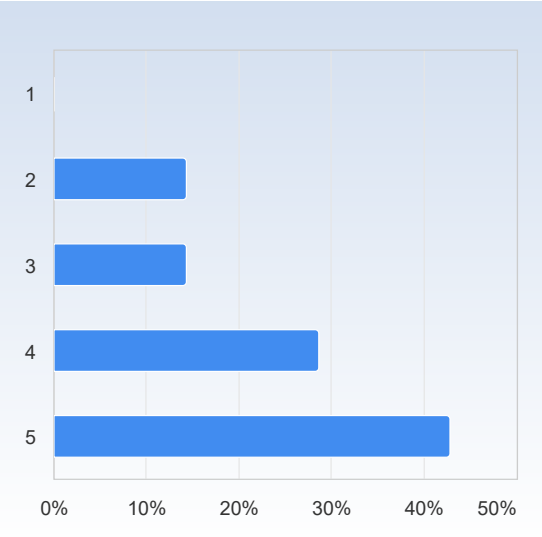
The course literature/material was a valuable learning resource.	Number of responses
1	1 (7.7%)
2	0 (0.0%)
3	3 (23.1%)
4	3 (23.1%)
5	6 (46.2%)
Total	13 (100.0%)



	Mean	Standard Deviation
The course literature/material was a valuable learning resource.	4.0	1.2

The information I received before the course start was satisfactory.

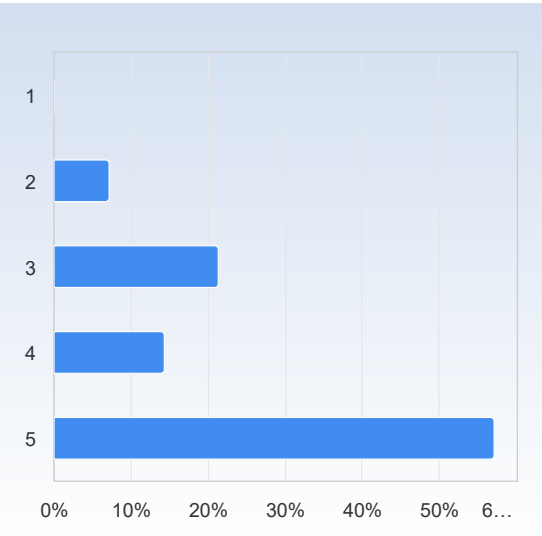
The information I received before the course start was satisfactory.	Number of responses
1	0 (0.0%)
2	2 (14.3%)
3	2 (14.3%)
4	4 (28.6%)
5	6 (42.9%)
Total	14 (100.0%)



	Mean	Standard Deviation
The information I received before the course start was satisfactory.	4.0	1.1

The communication with the teaching staff during the course was good.

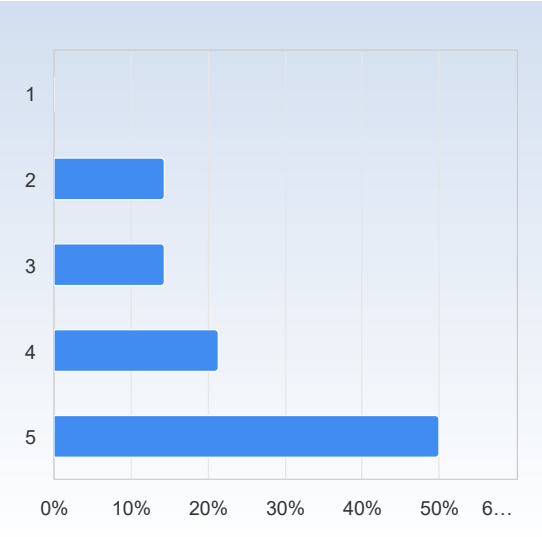
The communication with the teaching staff during the course was good.	Number of responses
1	0 (0.0%)
2	1 (7.1%)
3	3 (21.4%)
4	2 (14.3%)
5	8 (57.1%)
Total	14 (100.0%)



	Mean	Standard Deviation
The communication with the teaching staff during the course was good.	4.2	1.1

It was clear throughout the course what was expected of me.

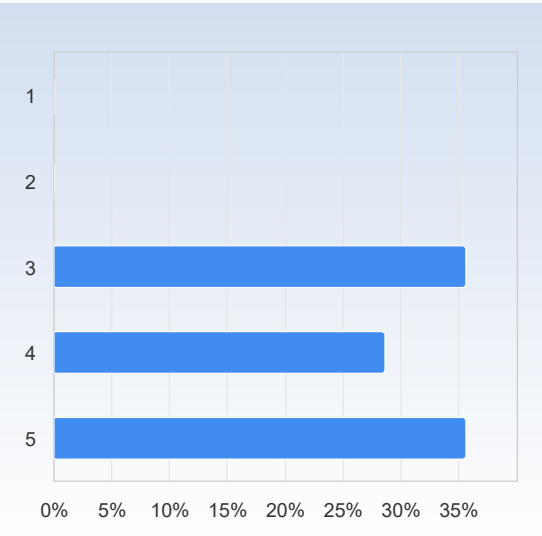
It was clear throughout the course what was expected of me.	Number of responses
1	0 (0.0%)
2	2 (14.3%)
3	2 (14.3%)
4	3 (21.4%)
5	7 (50.0%)
Total	14 (100.0%)



	Mean	Standard Deviation
It was clear throughout the course what was expected of me.	4.1	1.1

The course had a reasonable workload.

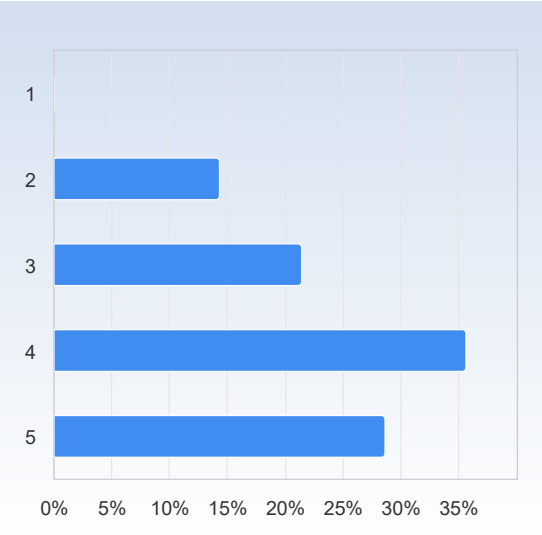
The course had a reasonable workload.	Number of responses
1	0 (0.0%)
2	0 (0.0%)
3	5 (35.7%)
4	4 (28.6%)
5	5 (35.7%)
Total	14 (100.0%)



	Mean	Standard Deviation
The course had a reasonable workload.	4.0	0.9

The workload was evenly distributed throughout the course.

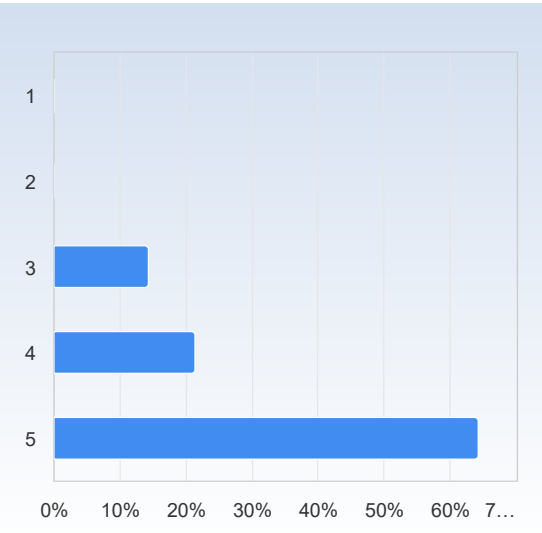
The workload was evenly distributed throughout the course.	Number of responses
1	0 (0.0%)
2	2 (14.3%)
3	3 (21.4%)
4	5 (35.7%)
5	4 (28.6%)
Total	14 (100.0%)



	Mean	Standard Deviation
The workload was evenly distributed throughout the course.	3.8	1.1

The examination matched the contents and level of the course.

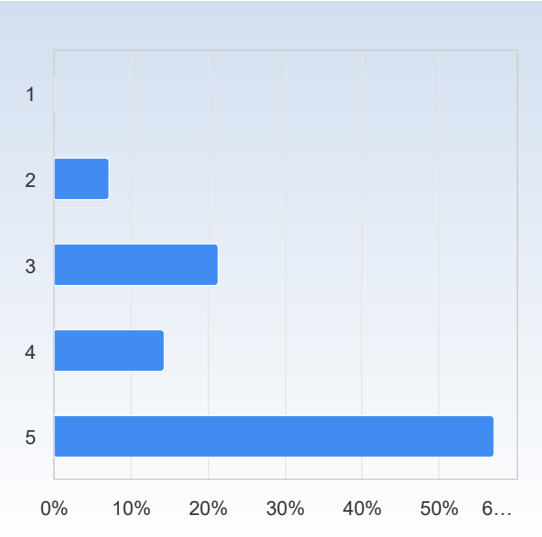
The examination matched the contents and level of the course.	Number of responses
1	0 (0.0%)
2	0 (0.0%)
3	2 (14.3%)
4	3 (21.4%)
5	9 (64.3%)
Total	14 (100.0%)



	Mean	Standard Deviation
The examination matched the contents and level of the course.	4.5	0.8

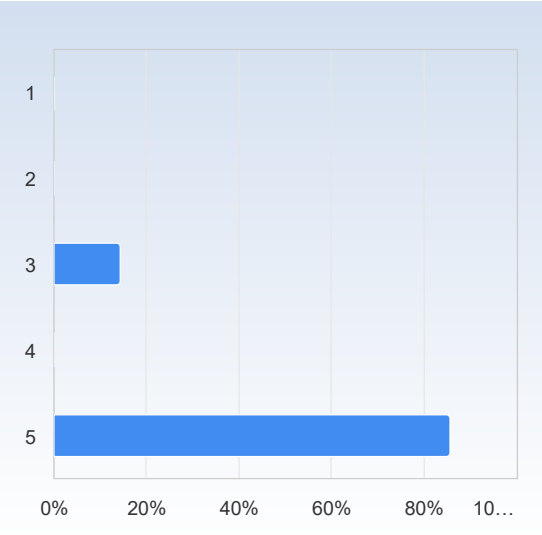
Overall, I am satisfied with the course.

Overall, I am satisfied with the course.	Number of responses
1	0 (0.0%)
2	1 (7.1%)
3	3 (21.4%)
4	2 (14.3%)
5	8 (57.1%)
Total	14 (100.0%)



	Mean	Standard Deviation
Overall, I am satisfied with the course.	4.2	1.1

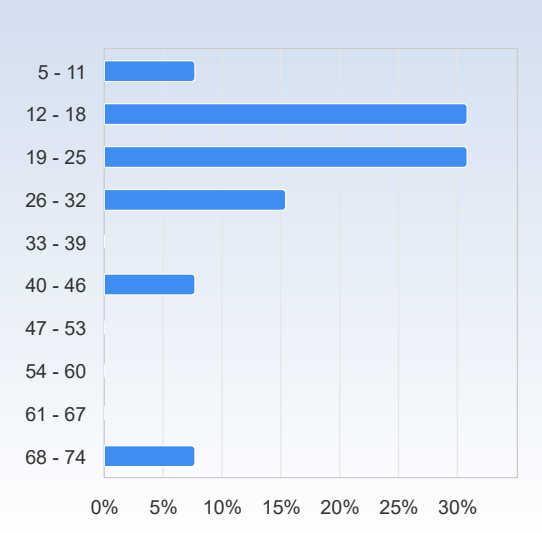
	Number of responses
1	0 (0.0%)
2	0 (0.0%)
3	1 (14.3%)
4	0 (0.0%)
5	6 (85.7%)
Total	7 (100.0%)



Mean	Standard Deviation
4.7	0.8

Average number of hours spent in total on the course per week (including scheduled activities):

Average number of hours spent in total on the course per week (including scheduled activities):	Number of responses
5 - 11	1 (7.7%)
12 - 18	4 (30.8%)
19 - 25	4 (30.8%)
26 - 32	2 (15.4%)
33 - 39	0 (0.0%)
40 - 46	1 (7.7%)
47 - 53	0 (0.0%)
54 - 60	0 (0.0%)
61 - 67	0 (0.0%)
68 - 74	1 (7.7%)
Total	13 (100.0%)



	Mean	Standard Deviation
Average number of hours spent in total on the course per week (including scheduled activities):	24.8	15.9

What did you appreciate most with the course?

What did you appreciate most with the course?
The seminars were really good to get a hang of the course work as I found the lectures to be quite fast-paced for me.
Seminars were really great. I enjoyed how well the material for the seminars was organized, and Thomas is a great teacher. He always encourages questions, and takes the time to reframe concepts we struggle with. I also really enjoyed the way the canvas page was set up with background information and study tips. At times the course was moving a bit fast for me but because of the detailed plan and posted notes, I could always read up and take notes ahead of lectures which helped me a lot. Also Anitha stays after lectures and answers questions which is super helpful.
Anitha staying to answer any questions.
The teacher was very quick with grading and that was immensely appreciated in preparation for other courses
the seminar teacher (I think mine is Jan Henrik Thomm) and the lecturer, Anitha, were super helpful and often stayed for questions after class. The fact that Jan and Anitha had different ways of explaining the same concept or problem-solving technique was really nice, because one may prefer one approach over the other (e.g. using a commutative diagram for change of basis, guessing orthonormal eigenbasis, and so on). The book was decent, I would say it's the first textbook that gave the feeling of a maths textbook (with loads of theorems and proofs), so it's a good exposure to higher-level mathematical text. I appreciate the exam grading speed and the exam also. I agree that the test should be proof-oriented (although it would be nice to have a list of 'what theorems are not included in the exam' to reduce the study load a bit). Oh, the seminar questions were quite fun also, especially the last few questions.
The teacher and the seminars!
Eigenvectors were cool
Sadly I got a bit of a late start to the course, and then due to personal reasons I fell off a little more after the fact. It essentially made me do most of this course on my own. I could potentially have made more of an effort to get reintegrated in the lectures and seminars, but I was struggling to do so. I want to preface that this is in no shape or form the fault of anything with the lectures or seminars. Both the lecturer and seminar leaders are very good in my consideration. Even though neither the seminars nor the lectures were important for my learning specifically, I still want to give credit to these individuals! I am saddened by the fact that I wasn't able to be more involved.
The seminars were really helpful. I was in Tom’s seminars and he does a really great job, getting people to present and also explaining concepts which we weren’t grasping. I also liked the lecture notes. They had lot’s of relevant examples except for in the chapter about the quadratic forms, there it was lacking.
It was clearly structured and the clear connection between the book and the lectures made it eazy to follow.
Both the lecturer as well as Tom were energetic and made the subject more enjoyable. Tom should get a special thank you from me for being a very good seminar leader. Pedagogical, charismatic and smart.

What do you think should be improved?

What do you think should be improved?
I think more lectures and seminars would help this course a lot. Anitha often had to skip parts of proofs, leave parts of the lecture for us to read up on our own at home. I feel like 4 more lectures would have made this course a lot easier, as it would have given Anitha time to do more examples in class and go through all the proofs fully. It would have also meant we had time to cover the material before working on the programming project, as a lot of the material we needed to do the programming project was later in the book. I also think finishing the material at least ten days before the exam would have been nice as it would have given us enough time to revise more thoroughly. I felt like I didn't have enough time at the end as we literally finished the last seminar questions two days before the exam.
I think that instead of the programming there could be the option to go into more theoretical parts of linear algebra, such as quotient spaces and isomorphism theorems.
Lecture: - Maybe more lectures. We were over-time almost every class and the last parts were usually the most important bits - Lectures in the morning (or having Multivariable analysis in the afternoon) would be nice. So the the self-study time is more evenly distributed. - I would like to see more linear algebra proof techniques in the lecture (which were rarely explained in the compendium) and by that I mean stressing on this rather than seeing concrete examples on the proofs. For example, to show F(u)=G(u) is showing u is in the ker(F-G), moreover by linearity we only need the basis to be in the kernel for all vectors to be also. I think we use this (or a variation of this) to show the uniqueness of linear transformation and multilinear form. With a tool like an inner product, we can use positive definiteness to get to the above argument and thus prove the properties of projections and reflections. Or picking a basis, induction, and transforming between matrix multiplication and an inner product under ON basis which were something we had done multiple times. To be fair, we saw many of these very early on but I only understood the significance a few weeks before the exam. (Actually, we talked about these a lot in the seminars, but it would be suitable for the lectures too since we mainly did the proofs there.) Compendium: - Too little motivation before each proof (although quite standard). It would be nice if we had something similar to Jan Fedrik's Don't Panic where motivations were explained before each proof, sometimes leaving difficult proofs as exercises but giving step-by-step hints. - I prefer having the field to be any field not just R, but it's quite understandable given the fact that real inner products and complex counterparts have different axioms. - Some definitions and arguments were ambiguous. For example, restriction (which is later covered in the foundation of algebra course), positively/neg oriented -- I think linalg 1 definition 1 is better, the one in linalg 2 is looking from the tip and see whether it is clockwise or not is confusing and impractical, the proofs related to rotations and isometries in 3 space were quite hard to follow -- in some case the arguments were skipped because too trivial even though they were not for us. - I think it's better to think of coordinate as a linear transformation from a vector space U to R^n (or K^n). With this, the change of basis can be regarded as a lin transf from R^n to R^n and thus we can use the exact same framework/approach of matrix representing transf to explain currently different notions. (in short, why have different ways of explaining the matrix of linear transformation and the matrix of change of basis when they are the same) Programming Project: - Even though I don't like coding, the tasks were quite interesting and were a nice change of pace to the lectures. The only suggestion would be that 3 persons should be the maximum (otherwise more tasks). It felt off to have 4 persons for 3 tasks.
Anitha could maybe read a bit less off her notes and speak more intuitively. For example more geometrical interpretations of matrices and eigenvalues.
I found it very frustrating that the exam was so close to the exam in multivariable analysis. I intentionally did the resit in this course because of it, to spread my workload.
There was too much material in the lecture notes to be comfortably covered in lecture, so lectures felt really rushed and I ultimately stopped going because I felt I wasn’t getting anything out of them. I wish that the most important proofs would have been more prioritised, and then really gone through instead of leaving large “obvious” chunks to us. The early determinant proofs for example, were very difficult to follow as the notation wasn’t something I was used to.
There are intuative and geometric explanations to a lot of topics that where often left out, the focus on the algebra made the underlying understanding harder to atain.
The course is difficult to teach as you more or less always prove more and more things, which is difficult to do in a good way when it isn't obvious for a beginner in the subject to see where we're going with the smaller theorems making it easy to get lost. The lectures mostly consisted of writing down the course littérature while briefly discussing it, which made them seem like a waste of time. It could be useful to sometimes discuss how different parts of the course ..., rather than saying something like "this now follows by theorem a", especially when said theorem was discussed a long time ago. This problem is smaller in the lectures, but very big in the lecture notes, which I find largely unreadable due to this. Another problem with the course literature is that the language is very dry and that certain claims are stated as obvious, when they aren't to a beginner in the subject. The dry language isn't necessarily a problem, it's just not what I was used to, the main problem is when this is combined with the nonexplanations of certain things. New content was gone through in the lectures very close to the exam, giving little time for revision. Consequently there were few revision lectures, something that is often useful. The lectures often took longer than the 1,5 hours that were expected. A solution may be to add another lecture some weeks as we otherwise only had two lectures a week.

Have you during this course experienced course literature, staff or teaching methods to be discriminatory in any way (gender, ethnicity, etc.)?

Have you during this course experienced course literature, staff or teaching methods to be discriminatory in any way (gender, ethnicity, etc.)?
No
Not in any way.
no
Nothing at all!
no
Absolutely not.
nope
Nope
No