



LUND UNIVERSITY  
Faculty of Science

Centre for Mathematical Sciences  
Division of Mathematics and Numerical Analysis

## Course Analysis for MATB22 Linear Algebra 2, Autumn 2023

### Course Information

**Lecturer:** Anitha Thillaisundaram

**Teaching assistants:** Jan Henrik Thomm and Frej Weiström Dahlin

**Number of students:**

70 newly registered and 30 re-registered.

31 students answered the course evaluation, 2 of them are enrolled on programme name.

### Examination

**Written examination:** 58 students passed.

- Ordinary examination 24/10 2023: 70 students participated and 46 of them passed.

- Resit examination 11/11 2023: 30 students participated and 12 of them passed.

**Final grades:**

In all, 58 students, including 12 re-registered students, have got their final grade.

23 passed with distinction.

35 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:**

No significant changes were made, apart from a slight reduction in the course content.

**Suggestions for the next course realisation:**

The amount of material for the course content will be further slightly reduced. Less of the content will be covered during the lectures, and exercise questions will be introduced to cover the important, but easier, proofs that were not covered during the lectures. These type of questions provide important training in answering theoretical questions. The importance of learning and knowing the proofs of results were only stressed during the lectures, but it will help to make this fact more visual by introducing such exercise questions. Some more geometric examples and explanations will be introduced into the lectures, where possible. Several other books (which offer different perspectives) will be listed on the course Canvas page, to provide a guide for other optional references. Lastly, slightly less past exam papers will be made available and their availability will be staggered throughout the course. The reason for putting up less exams is that it seems that several

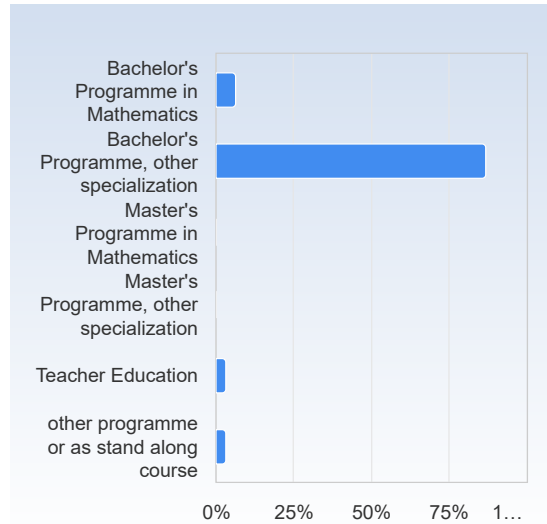
students revise for the course just by doing past papers, and hardly learning the theoretical aspects of the course. This is a very dangerous strategy, especially since this only trains one to know methods for high-frequency questions, but it does not aid one's understanding of why such a method is implemented. It was clear that this was the case for several students, for example who answered the November 2023 question 1 in exactly the same way as the October 2023 question 1, even though the set-up called for a different perspective (though the same approach to the problem). It will be put in writing in the form of some revision guidelines that an example of a good revision strategy is to, say, spend 60% of the time learning the theoretical aspects of the course, and 40% of the time consolidating this knowledge solving questions. The staggering of the past exam papers has the purpose of reminding students that one needs to constantly revise the earlier course material, since many definitions and ideas are used in the later part of the course. Also each time an exam is made available, the students will be reminded to treat the exam (or the relevant part of it) as a mock exam, so to not refer to notes and to time oneself. This will help those students that find exam conditions stressful.

# Linear Algebra 2 Autumn 2023

Answer Count: 31

## I have studied this course as part of

I have studied this course as part of	Number of responses
Bachelor's Programme in Mathematics	2 (6.5%)
Bachelor's Programme, other specialization	27 (87.1%)
Master's Programme in Mathematics	0 (0.0%)
Master's Programme, other specialization	0 (0.0%)
Teacher Education	1 (3.2%)
other programme or as stand along course	1 (3.2%)
<b>Total</b>	<b>31 (100.0%)</b>



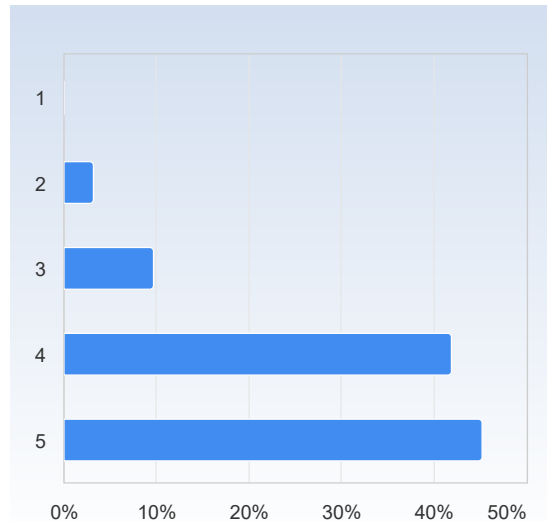
	Mean	Standard Deviation
I have studied this course as part of	2.2	0.9

## 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.

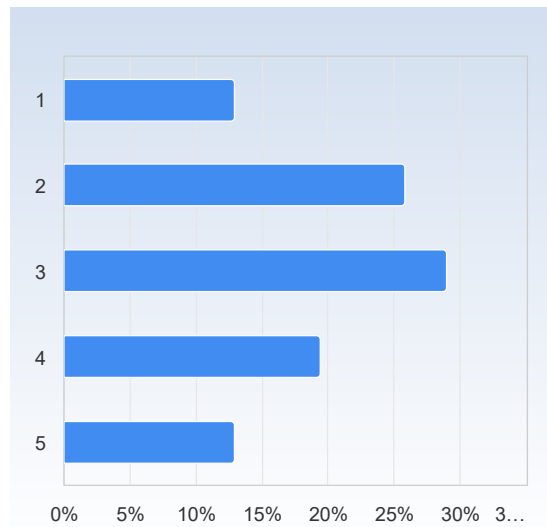
My prior knowledge has been sufficient to assimilate the contents of this course.	Number of responses
1	0 (0.0%)
2	1 (3.2%)
3	3 (9.7%)
4	13 (41.9%)
5	14 (45.2%)
<b>Total</b>	<b>31 (100.0%)</b>



	Mean	Standard Deviation
My prior knowledge has been sufficient to assimilate the contents of this course.	4.3	0.8

### The way the course was taught and organised suited me.

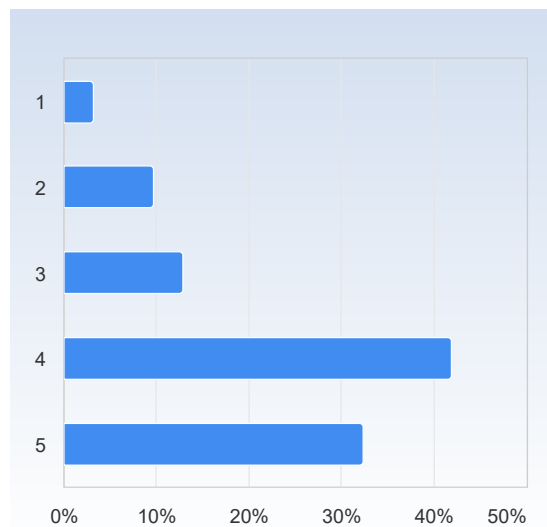
The way the course was taught and organised suited me.	Number of responses
1	4 (12.9%)
2	8 (25.8%)
3	9 (29.0%)
4	6 (19.4%)
5	4 (12.9%)
Total	31 (100.0%)



	Mean	Standard Deviation
The way the course was taught and organised suited me.	2.9	1.2

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

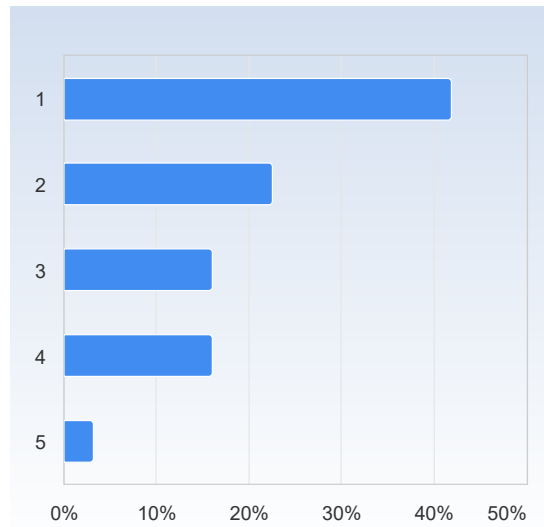
The number of teacher lead activities (lectures, seminars etc.) has been satisfactory.	Number of responses
1	1 (3.2%)
2	3 (9.7%)
3	4 (12.9%)
4	13 (41.9%)
5	10 (32.3%)
Total	31 (100.0%)



	Mean	Standard Deviation
The number of teacher lead activities (lectures, seminars etc.) has been satisfactory.	3.9	1.1

**The lectures were valuable for my learning.**

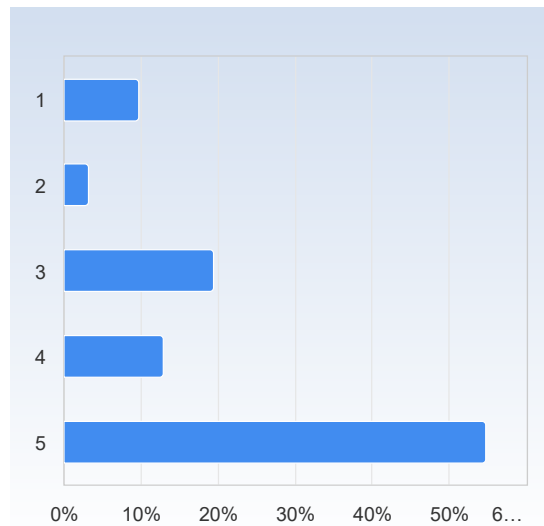
The lectures were valuable for my learning.	Number of responses
1	13 (41.9%)
2	7 (22.6%)
3	5 (16.1%)
4	5 (16.1%)
5	1 (3.2%)
Total	31 (100.0%)



	Mean	Standard Deviation
The lectures were valuable for my learning.	2.2	1.2

**The seminars were valuable for my learning.**

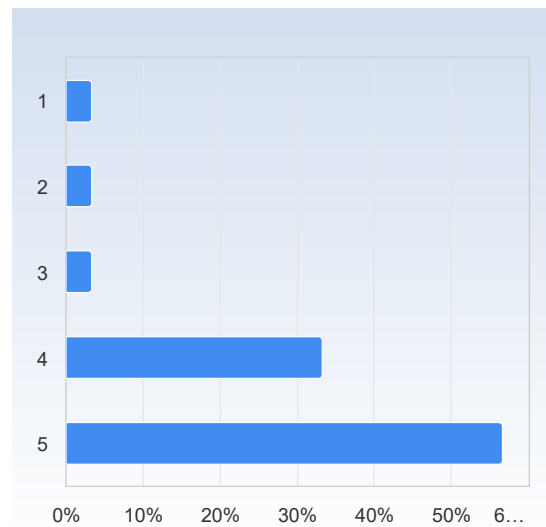
The seminars were valuable for my learning.	Number of responses
1	3 (9.7%)
2	1 (3.2%)
3	6 (19.4%)
4	4 (12.9%)
5	17 (54.8%)
Total	31 (100.0%)



	Mean	Standard Deviation
The seminars were valuable for my learning.	4.0	1.3

**Studying on my own was valuable for my learning.**

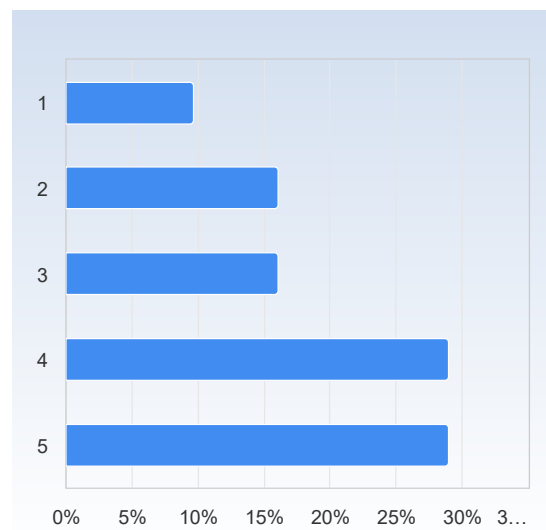
Studying on my own was valuable for my learning.	Number of responses
1	1 (3.3%)
2	1 (3.3%)
3	1 (3.3%)
4	10 (33.3%)
5	17 (56.7%)
Total	30 (100.0%)



	Mean	Standard Deviation
Studying on my own was valuable for my learning.	4.4	1.0

**The course literature/material was a valuable learning resource.**

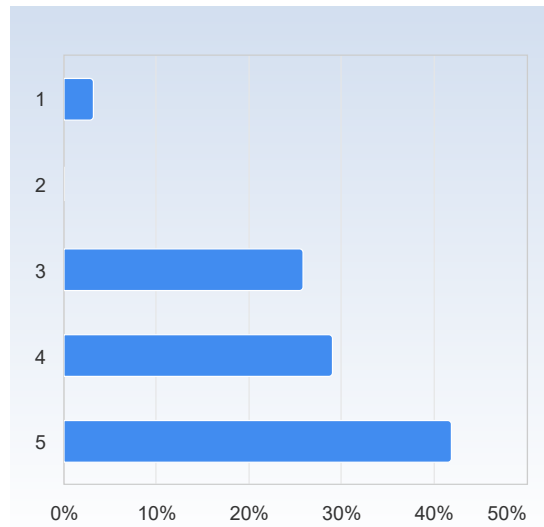
The course literature/material was a valuable learning resource.	Number of responses
1	3 (9.7%)
2	5 (16.1%)
3	5 (16.1%)
4	9 (29.0%)
5	9 (29.0%)
Total	31 (100.0%)



	Mean	Standard Deviation
The course literature/material was a valuable learning resource.	3.5	1.3

**The information I received before the course start was satisfactory.**

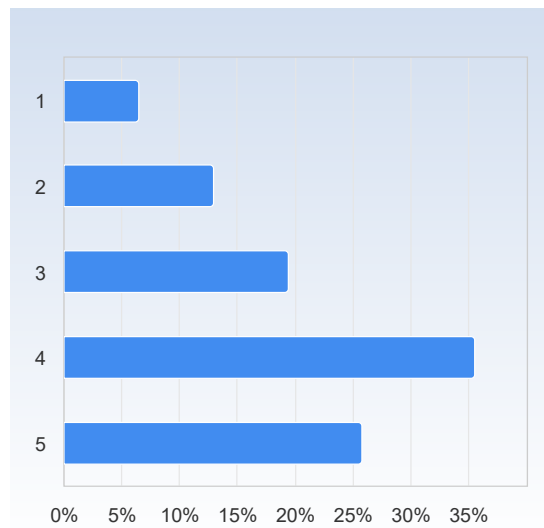
The information I received before the course start was satisfactory.	Number of responses
1	1 (3.2%)
2	0 (0.0%)
3	8 (25.8%)
4	9 (29.0%)
5	13 (41.9%)
Total	31 (100.0%)



	Mean	Standard Deviation
The information I received before the course start was satisfactory.	4.1	1.0

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

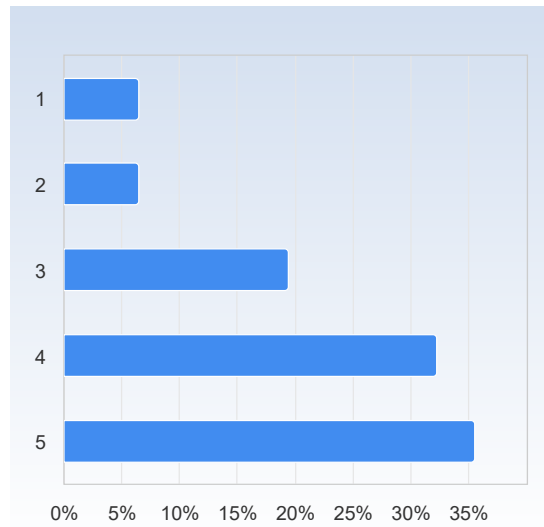
The communication with the teaching staff during the course was good.	Number of responses
1	2 (6.5%)
2	4 (12.9%)
3	6 (19.4%)
4	11 (35.5%)
5	8 (25.8%)
Total	31 (100.0%)



	Mean	Standard Deviation
The communication with the teaching staff during the course was good.	3.6	1.2

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

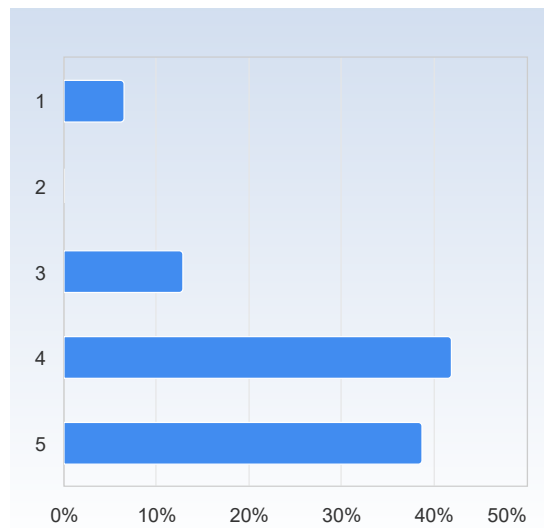
It was clear throughout the course what was expected of me.	Number of responses
1	2 (6.5%)
2	2 (6.5%)
3	6 (19.4%)
4	10 (32.3%)
5	11 (35.5%)
Total	31 (100.0%)



	Mean	Standard Deviation
It was clear throughout the course what was expected of me.	3.8	1.2

**The course had a reasonable workload.**

The course had a reasonable workload.	Number of responses
1	2 (6.5%)
2	0 (0.0%)
3	4 (12.9%)
4	13 (41.9%)
5	12 (38.7%)
Total	31 (100.0%)

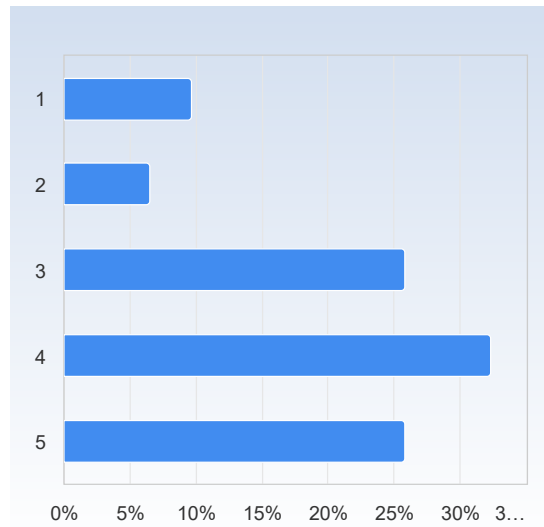


	Mean	Standard Deviation
The course had a reasonable workload.	4.1	1.1



**The workload was evenly distributed throughout the course.**

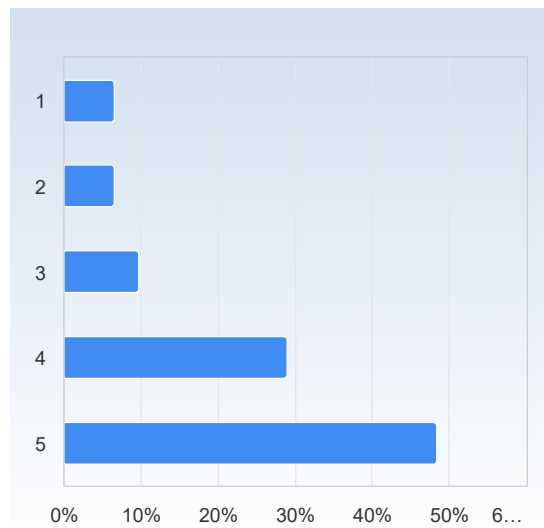
The workload was evenly distributed throughout the course.	Number of responses
1	3 (9.7%)
2	2 (6.5%)
3	8 (25.8%)
4	10 (32.3%)
5	8 (25.8%)
Total	31 (100.0%)



	Mean	Standard Deviation
The workload was evenly distributed throughout the course.	3.6	1.2

**The examination matched the contents and level of the course.**

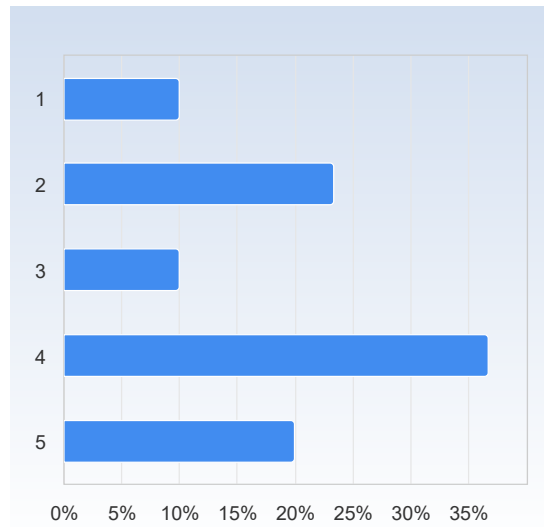
The examination matched the contents and level of the course.	Number of responses
1	2 (6.5%)
2	2 (6.5%)
3	3 (9.7%)
4	9 (29.0%)
5	15 (48.4%)
Total	31 (100.0%)



	Mean	Standard Deviation
The examination matched the contents and level of the course.	4.1	1.2

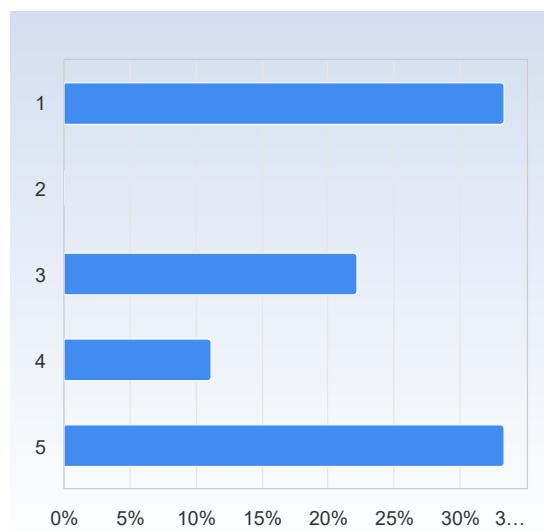
**Overall, I am satisfied with the course.**

Overall, I am satisfied with the course.	Number of responses
1	3 (10.0%)
2	7 (23.3%)
3	3 (10.0%)
4	11 (36.7%)
5	6 (20.0%)
Total	30 (100.0%)



	Mean	Standard Deviation
Overall, I am satisfied with the course.	3.3	1.3

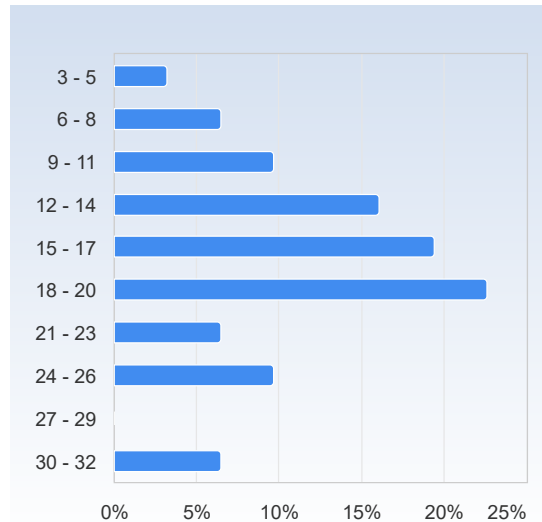
	Number of responses
1	3 (33.3%)
2	0 (0.0%)
3	2 (22.2%)
4	1 (11.1%)
5	3 (33.3%)
Total	9 (100.0%)



	Mean	Standard Deviation
	3.1	1.8

## 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
3 - 5	1 (3.2%)
6 - 8	2 (6.5%)
9 - 11	3 (9.7%)
12 - 14	5 (16.1%)
15 - 17	6 (19.4%)
18 - 20	7 (22.6%)
21 - 23	2 (6.5%)
24 - 26	3 (9.7%)
27 - 29	0 (0.0%)
30 - 32	2 (6.5%)
Total	31 (100.0%)



	Mean	Standard Deviation
Average number of hours spent in total on the course per week (including scheduled activities):	16.7	6.5

## What did you appreciate most with the course?

What did you appreciate most with the course?

The more theoretical aspects i.e. proofs of theorems like the spectral theorem and Sylvester's law of inertia.

The seminars, but only with Frej, not with the other teacher. I wouldn't have passed without him, because everything else wasn't helpful at all.

Frej the TA is invaluable to this course and I pity all students that will have to take it without him. The seminars in short. The programming project was also pretty good.

Seminar teachers were really helpful, I attended seminars in both classrooms and both teachers were helpful in different ways, I prefer one of the two but that's just a personal preference of the way they teach, not an issue by the other.

I think the overall way the course is organized is good because you get to do proofs and understand theorems in lectures and you get very good training in solving the exercises because Frej is really good at explaining solutions.

I appreciated the seminars so much since that was probably where I learnt almost everything before the exam. If you would not understand the material you could get examples of how you can think on certain problems and tricks for the problems. Hearing someone explain in a little different way made me get a better understanding of the subjects and even though some of the fellow students did present the problems in a weird and not understandable way it was quite nice to see how they attacked the problems in ways neither the TA or the lecturer was thinking about. But all credit to the TA:s

Frej is the only reason I passed this course. You can feel that he likes what he does, and he has a great way of sharing his knowledge. Thanks to Frej for being so great!!!

The programming project was also on a good level.

The programming project was fun and on a reasonable difficulty level. The examination was what I expected compared to old exams.

Course Material

The content.

The content of the course is useful in mathematics as well as other applied areas. Frej the seminar teacher especially made the seminars a very valuable learning experience.

The course content was interesting and a good followup from mata21 and mata22.

Frej is an amazing teaching assistant. He was the only reason I learnt anything at all.

The seminars (with frej) he is very good at making sure we are learning and not just presetting exercises.

Easy but also applicable in presenting the fundamental theorems of vector spaces, linear algebra and spectral theorem. The final and 2nd final questions in exam and past paper usually could be a decent bridge and a toy problem in guiding students to have a basic intuition on linear functional analysis. Overall the course has a broad scope but easy to understand.

That it was very rigorous

Seminars - Frej is a great teacher and the structure of the seminars were really helpful.

The seminars.

The clear structure of the course and its content

Seminars. Having a lot of old exams each with similar structure to practice

The lectures.

The number of available past exams

The seminars led by Frej.

My independent learning. The only things the course contained which were valuable to my learning were the questions in the book and the instructive seminars.

the past examinations and solutions

## What do you think should be improved?

### What do you think should be improved?

The professor preparing more before the lecture, and actually knowing what to do. More structure in the lectures. Having more reasonable values for the exam!

I think the schedule should be changed so that there is more time between the last course material being covered and the exam to allow for more time for revision. The revision time also overlapped with revision for MATB21 Analysis in several variables 1 which was unsatisfactory.

Better lectures

The other seminar teacher could be better. The book is barely understandable, more visualizations would be helpful, also more example exercises. The lectures shouldn't be just reading from the book because I can do that on my own, but rather a different view on the material so that it is actually understandable, or also doing hard exercises.

The structure of the lectures. Having all the information written on the blackboard before the start of the lecture is overwhelming and makes it difficult to keep track on where we are in the lecture and to concentrate.

It was hard to focus during lectures because everything was already written on the boards. It was easy to get "lost" while the lecturer was explaining and harder to engage with the material. I would prefer if the lecturer would write as they explain a certain topic like we did during the last lectures when we were solving past exams and answering questions, this way is easier to follow and more engaging resulting in more focus during the lecture.

Nothing major, I think the programming exercises bust me revisited because some tasks are only covered in the later parts of the course

I did not like the way the lectures were, it's hard to listen and take notes when everything already was written in the blackboard beforehand and I could not take in what the lecturer said since it was just taking notes. Also, it was almost written from the book so if you would not understand what the book said it was no use to go to the lecture since she said almost exactly as the book. Also, getting concrete quotes examples was valuable for me and we did hardly get that on the lectures.

Also, I did not enjoy the programming project since it took a lot of time from studying for the exam, so it would be better to maybe have a shorter project due in maybe the middle of the reading period instead of the Friday the week before the exams. I also found it not valuable for my understanding of the questions and subject.

First and foremost, do not write things on the blackboard before the lecture starts. It's impossible to actually keep up during the lecture. Even if I am not writing, I never have time to process the information before a new subject is brought up. This would improve if you would write at the same time, because that creates natural pauses.

Secondly I believe it's important to include the class more, stopping and actually asking questions instead of just asking if we understand will help. For example this will create room for use to think about what you just talked about. And if this later shows that we do not understand you should then try putting it in another way, so we actually understand before you continue.

I believe both of these points can be pretty easily achieved, especially because Anita has potential to be a great lecturer.

I do think that for me atleast the language used what a bit to formal, which also contributed to me not understanding the lectures. And therefore in the end deciding to not attend them.

Another point I want to bring up is the lectures before the examinations. It is important that they are more structured than they were. Maybe actually just have an exam that you tell us you are going to do and stick to it. Another idea is to send out a mentimeter where we before this lecture can ask our questions. So you can read through them before, and therefore will have it easier to answer them during the lecture.

My last point, sorry for dragging it out but I believe it is important for you to know my thoughts. I believe the exam was for the most part up to standard with the last exams. I believe this is great. However I felt I was more graded on how well I can calculate questions instead of my understanding for the subject. I answered every question and I know that the method I used was correct, however I lost a lot of point on the calculation being to hard. The time is not enough for us to be able to triple check the answers. The calculations takes a long time as it is. Therefore the numbers used should contribute to easier and faster calculations.

As a last note I want to say that this does not mean that the course was overall bad, it is easier to be hung up on what was done poorly, than what was good. So thank u Anita for sticking to a well structured course. I believe these improvements will make this course great for future classes.

More time for questions on lectures.

The lectures. They didn't feel very giving for the most part.

The lecturer speaks way to quickly and since she writes down everything on the blackboard before talking about it (she writes everything down before the lecture or during the break), we as students don't really have the time to write it down and listen simultaneously (to a satisfactory degree). It would also really help if the lecturer, when introducing a new theorem, took just a brief minute or two to express what the theorem actually states. For example there could be a very simple example (directly) after each theorem or she could talk more broadly about what the theorem actually states and why it is important at all. This would really help and take the level of the lectures from 0/5 to 3/5 at least. If she also spoke just a tad more slowly and didn't write everything down beforehand it would have been an easy 5/5 in my opinion.

If the lecturer feels like the time is really constrained (and that is the reason why she does not do the above) then I would really suggest (I mean I would prefer) that she covers a reduced amount of the course content during the lectures.

She could cover mainly the most important/difficult sections, and some sections she could just say that this is stuff that the students should read on their own (there are multiple sections that I did not have any trouble understanding that were a bit simpler than the other sections). Then if anyone has any questions about this "self-study" section we could ask questions at the beginning of the next lecture or just on the seminars. This way she would have more time and maybe feel more inclined to do what I mentioned above.

I don't know exactly how but the lectures could be given in a different way such that what is taught in the lectures can add on to the content of the course book. What the lecturer wrote on the blackboards was almost identical to the paragraphs in the course literature, and the lecturer wrote everything beforehand so it made it difficult to keep up with the pace. So it felt more effective to read the textbook on my own instead of trying to listen and failing to keep up or maintain focus every time.

The seminars should be improved, the seminar leaders were not satisfactory as a resource to learn the material as compared to matb21. If you had done the exercises beforehand it was a waste of time going since no discussion were had; and if you hadn't, then the seminars didn't offer any guidance, instead just provided solutions without explanation. (Which caused more confusion).

Also the time between end of course and exam was very tight. Exam should switch place with matb21 since we were done with course material way earlier here.

Loads of things need improving. The lectures were useless. During the lectures, the course book was just rewritten on the board. I retrospectively wish I had not attended the lectures as they were not pedagogical and did not teach me anything.

The course literature is incredibly hard to understand. It has loads of complicated math language which makes it hard to read and even harder to follow the lectures (considering that the lectures only copies the course literature). It was also very hard to know what was considered useful information and what was not. It is just way too much information way too many proofs, theorems, definitions and barely any examples. It is also beyond hard to know what is considered a valuable proof to learn, which became very apparent to me during the exam. The last question, I had considered not a possible exam question considering that we barely had touched upon the subject and done no exercises on the topic. The exam overall seemed much more difficult than previous years exams. Not only were we supposed to prove 3 different theorems compared to two previously, but the numbers in the "normal" exercises were beyond complicated and there were many unnecessary steps that had to be taken.

The lecture structure of "theorem proof theorem proof"

The lectures seemed somewhat unnecessary because it was essentially the same as just reading the book.

The exam questions types is way too redundant in the past years. I appreciate the course content, and yet I hope it could incorporate

concepts more relevant to current 2020's decade. For example, Linear algebra is a necessary bridge to data science and machine learning. I wish the course could introduce briefly about the connections of linear algebra to those computer science topics, such as briefly explain what is the application of linear algebra in techniques of machine learning analysis during lectures and maybe introduce some related toy problems in tutor sessions and exam. I believe students in the future would be more interested in real life applications of vector algebra, matrix algebra and transformations etc. , since the future technology would be more and more related to computer science and data science development and they may work with it along the decades. But these are only my brainstorm(s lol), please don't be serious about it. In a traditional perspective the content is excellent.

Some more emphasis on geometric application to build visual intuition on the otherwise very abstract ideas in the course  
I recommend 3 blue 1 brown's youtube series on linear algebra

Lectures - just reading the textbook is not very helpful, it would be better if the lectures gave a different perspective on things. It would've also been good if the regular content of the lectures was finished a bit further away from the exam but I understand that this may be difficult to make happen.

The lectures could be restructured I bit where the phase should be a little slower in some sections.

No clue

That the different kinds of initial-value problems were discussed a little more during the lectures.

The coursebook along with lecture notes could have more examples showing how to solve exercises

The lectures were very similar to the book content. Perhaps they would be a bit more helpful if they gave explanations that were a bit different.

The course book used is abstract when it shouldn't be, meticulous and detailed when it need not be. It's written in such a way that it is only of educational value when you already know the course contents and need to know what language the teacher is going to use when writing exam questions, or when used as a glossary to flip through.

The professor (Anitha T.) clearly is very intelligent and capable in her field, but has a lot to learn about how to teach this course. She frequently just read from her notes and when a student asked her to clarify or answer a question about something she just explained, didn't know the answer. This made attending lectures a near fruitless endeavor, as you would often understand better and quicker by reading the relevant chapters yourself.

The exam questions were posed in such a way that in order to get to the answer that was sought, a small detail that was tucked away somewhere in the coursebook was needed in order to answer the question. Looking at past exams, the questions posed in her exams show how she lacks understanding about what the student know. Not only did more than 50% of the students not pass the first exam, but the questions on the re-exam were jarringly different from the original exam - forcing the students to remember subordinate clauses and oddly specific edge-cases that (atleast from the 10-or-so, that are on canvas) have not made their appearance in any past exams. Of course, a student is to be sure enough of the material to be able to answer such questions, but my view is that the old exams implicitly give the message to the students : These are the most important take-home messages in this course. Anitha seems to have actively - perhaps in an attempt to avoid the formulaic structure of past exams - to have written her questions in such a way that no question would mirror what has been in a past exam question. While I sympathize with her if this was her thinking, I believe this method also excludes many students from being able to pass the exam.

Many of the other students I've spoken with have told me the same thing; "I studied for this exam a lot - but some of the questions in the exam were so strange and different from what I've seen before that I didn't know how to answer.". If a student studies poorly and fails an exam, they face their own consequences. But if a teacher writes an exam that poorly reflects the course goals and materials, the students are punished twice: by having their workload up until the re-exam increased, and by the implicated (and even direct, as was the case when discussing the exam at the presentation of the results of the exam) message "If you knew the course well enough (// were more intelligent), the phrasing and structure of the question should not stop you from passing."

I don't believe that Anitha is a bad professor - just an inexperienced one in teaching this course. But for some students, her current inadequacies and inexperience can have severely damaging consequences on their lives.

In my opinion, the course book needs to be changed. There are several other books on this subject that are much more informative, easily parsed and intuitive.

Anitha needs to brush up on the course material, and put energy into understanding WHAT the students struggle with and WHY. Relying on students to ask questions when they do not understand, and then frequently giving unsatisfactory, imprecise or even no answers at all give the students the impression that she's lecturing to those already comfortable with the subject and that there is no point in asking for clarification. The most poignant example I can think of was the lecture where she was to go over past exam questions: Anitha asked the students whether they had any questions they would like her to do - which felt detached and unserious. When a question was asked of her, she spent over 40 minutes on a question, and finally could not even answer the question. At the break in that lecture I saw that no more than 25% of the students actually went back in to the lecture, as most concluded it to be of no use.

the lecture didnt help me understand the material. maybe a less by the book approach would be better.

Seminars where sometimes confusing it was not always clear if the result on the board is correct or not.

**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.
No.
No, nothing of the sort.
no
No
No nothing of this sort
No
no
No.
No.
No
no
No not that i know of
I have faced zero discrimination or any unfair treatment.
no
no
No
No
No
No.
No.
It was sometimes weird that the tutors started speaking in swedish. Us international students were therefore cut off the conversation. But this didn't happen that often