

Course analysis – MATA21 HT20

Lecturer: Eskil Rydhe (second half).

Seminar teachers: Joakim Cronvall, Raul Hindov, Tien Troung.

Summary: The ongoing pandemic has required large adaptations of the practical aspects of teaching and examination. The handling of this problem appears to have been acceptable to both students and teachers. Students are in general satisfied with the teaching, but still criticise certain parts to varying extents. In particular, students have had mixed experiences with the different mentor groups. Also, some seminar teachers are more appreciated than others.

Experience indicates that oral follow ups are a preferable alternative to video surveillance in a remote examination situation.

One student describes experience of misogynistic attitudes. It's not clear if it's from students or teachers, but my interpretation is that it's from students. Such attitudes are hardly unexpected anywhere, but not any less serious.

Number of students: According to Canvas, $137 + 32 + 2 = 171$ Ladok students, distributed over the three sections MATA21, ÄMAD01, Other.

Anomalies: The administration of the course was carried out according to existing routines (lectures, seminars, mentor meetings etc.). The teaching and examination procedures however have required adjustment to the ongoing pandemic (Covid-19).

In order to comply with regulations of public gatherings during the pandemic, students were split into three groups. These would take turns to visit lectures on campus. Students off campus would watch live streams of the lectures, which were also recorded. A similar procedure applied for the seminars.

The mid-term change of lecturer essentially coincided with stricter Covid regulations. As a result, all teaching activities (including mentor meetings) went on line.

The mid-term exam was administered as a take home exam with surveillance via Zoom. The regular and retake exams were administered as a take home exam followed by a short oral exam. The alternative with Zoom surveillance was very stressful for everyone involved. The follow up oral exams took quite some time, but this seems like the preferable alternative.

Exam results: The exam results are presented in the two tables below. The bonus points from the mid-term exam have affected the results of less than a handful of students. By an unfortunate mistake in its construction, the regular exam became slightly easier than what I intended. The pass rate on the regular exam was 65%, of which 14% achieved a pass with distinction (this last number excludes the ÄMAD01 students). The pass rate was somewhat higher than the previous semester (57%), whereas the pass with distinction rate was lower (21%). The pass rate on the retake exam was 26%, substantially lower than the previous semester (44%). A total of 124 students took either of the exams, and the total pass rate was 70%. All students qualified for an oral exam have also passed it. Of the students who qualified on the first try, a great majority did very well.

Course section	MATA21	ÄMAD01	Other
# submissions	98	19	1
# U	32	9	0
# G	52	10	1
# VG	14	0 ¹	0

Table 1: Results on the regular exam, broken down into three sections.

Course section	MATA21	ÄMAD01	Other
# submissions	29	9	1
# U	21	7	0
# G	8	2	1
# VG	0	0 ¹	0

Table 2: Results on the retake exam, broken down into three sections.

¹The grades for ÄMAD01 students are based on more than this single exam.

Results of course survey

40 students answered. Out of these, 13 (32.5%) were from the Bachelor's programme in Mathematics, 19 (47.5%) from Bachelor's Programme in Physics, Theoretical Physics, Astronomy, and 8 (20.0%) from Teacher Education.

Students were asked to estimate the "Average number of hours spent in total on the course per week (including scheduled activities):". The average was 20.3, and the standard deviation 12.8. The average is lower than the previous semester (24.6), but in line with previous autumn (21). The standard deviation is of typical size.

The following statements were also graded on a scale from 1 to 5, where 1 = disagree completely \rightarrow 3 = partly agree \rightarrow 5 = agree completely. The table shows the average, standard deviation, and the average from the previous semester.

Statement	μ	σ	μ_{VT}
My prior knowledge has been sufficient to assimilate the contents of this course.	3.8	1.1	4.0
I have participated actively in the course.	4.1	1.0	3.9
The way the course was taught and organised suited me.	3.4	1.2	3.6
The number of teacher lead activities (lectures, seminars etc.) has been satisfactory.	4.2	0.9	4.3
The lectures were valuable for my learning.	4.0	1.0	4.0
The seminars were valuable for my learning.	3.5	1.2	3.6
The assignments we valuable for my learning.	4.0	1.1	4.2
Studying on my own was valuable for my learning.	4.4	0.8	4.2
The mentor groups were valuable for my learning.	3.9	1.1	—
The use of Python valuable for my learning.*	2.9	1.5	3.5
The course literature/material was a valuable learning resource.	4.0	1.1	4.0
The pre-recorded Youtube videos were valuable to my learning.	4.1	1.1	—
The recorded lectures were valuable to my learning.	3.2	1.5	—
Piazza was valuable to my learning.	2.2	1.1	—
The information I received before the course start was satisfactory.	3.7	1.0	3.9
The communication with the teaching staff during the course was good.	4.2	0.8	4.0
It was clear throughout the course what was expected of me.	3.8	1.0	3.8
I have received valuable feedback from my teacher/teachers during the course.	3.5	1.1	3.4
The course had a reasonable workload.	3.7	1.0	3.7
The workload was evenly distributed throughout the course.	3.7	0.9	3.7
The examination matched the contents and level of the course.	4.3	0.8	3.9
Overall, I am satisfied with the course.	3.9	1.0	4.0
The transition to online teaching because of Covid-19 worked well, given the circumstances.	3.8	1.1	—
The transition to online teaching because of Covid-19 did not have a negative effect on my learning.	2.8	1.4	—
The course has increased my ability to read a mathematical text.	4.5	0.6	4.1
The course has increased my ability to communicate the subject in writing.	3.9	0.9	3.7
The course has increased my ability to communicate the subject orally.	3.5	0.9	3.2
The course has increased my ability to cooperate.	3.1	1.1	3.0
The course has increased my ability to search and process information.	3.7	1.1	3.1
The course has increased my ability to analyze and solve problems.	4.1	0.8	3.9
As a result of this course, I feel confident about tackling unfamiliar problems.	3.4	1.2	3.4
The course has stimulated my overall interest for mathematics.	4.0	1.1	—

Most values are very stable. There appears to be a drop in the students' perceived benefit from using Python. I imagine that this is because I have stressed this material less than Jan-Fredrik.

Piazza also receives a very low ranking. We have noticed that a few good students have used it very actively. This has sometimes led to some elitist tendencies, which may have repelled other students from this learning resource.

Students appear to think that the transition to online teaching was handled in an acceptable way, but also state that their learning was inhibited by this adaptation. It seems like a rather interesting coincidence that the following statements which basically concern the ability to communicate and explore the subject independently have all received slightly higher scores than the previous semester.

Answer to free text questions

Summary: As expected, comments are mixed. The teaching staff is described using mostly positive terms. There seems to be a slight trend to criticise the compendium, but it's far from unanimous. Students appear to have very mixed experiences of the mentors.

One student describes experience of misogynistic attitudes. It's not clear if it's from students or teachers, but my interpretation is that it's from students.

What did you appreciate most with the course?

That there was plenty of old exams that you could do before the actual exam.

I really liked the mentor meetings since it gave me an opportunity to ask questions, cooperate and get less stressed about the course. I also think that the assignments focused on what was important in the chapters and it gave perception on what was important to know.

Jan-Fredrik's way of giving lectures on-line and at site, simultaneously. When this pandemic is over, I wish we could keep the best parts from how we adapted; being able to follow the lecture from home (for whatever reason) is excellent. Webcams, microphones and Wacom-style tablets should be standard equipment for lecture halls, along with video projectors. Unfortunately, the classic blackboard is ill-working (as experienced in parallel courses this autumn) for these purposes.

The manner in which the take-home exam was supplemented by a short oral exam was a good solution. Monitored Zoom exams made to mimic classic exams are really stressful!

The interaction of some of the staff with students and also the level that the course challenges the students

I appreciate every teacher that taught us, they did their best and it was really helpful. I appreciate problem seminars they were the most helpful to my learning because it was challenging and answered the questions that I could not solve, also mentimeter was another helpful tool. Piazza was also helpful because I found some really good answers there and discussion between students which was excellent. I can mention that recorded videos of explaining things little by little was very helpful before taking the lecture. I really appreciate everything about this course.

The lectures.

The mentors who kept me on track with the learning.

The literature.

The feeling that the staff really wanted everyone to do well, not just get the semester over with. Especially the prerecorded videos of certain proofs were very helpful.

Jan-Fredrik's humor and Esklis ability to make us calm.

I liked the homework assignments, as they gave a good indication of what you needed to know.

All of the teachers' enthusiasm to teach us.

jan-fredrik was funny

The lectures note were all I needed to go through the course and it's a good thing as I like having all my resources in one place. There are just enough exercises to practice with but not get overwhelmed like in some books with 5 million exercises.

The content, learning mathematics from scratch

Assignments

I enjoyed the seminars, they were very useful when trying to learn how to solve different kinds of problems.

Seminars

The mentor group was a great place to discuss problems to exercises or discuss mathematics with the teacher-student and students. I also got to meet some new students.

The coursebook, the lectures.

How passionate the teachers/teacher assistants were about the subject. I felt their knowledge about the course was far beyond sufficient.

Lectures

The great consideration for the majority of students, that find their first semester very challenging. However, the more ab-

stract bits of math in the curriculum; the section on MVT and that continuity implies integrability, received almost no treatment outside of the coursebook. Even if they are difficult, they should get proper attention from the teachers.

All of the teachers and TA's have been very good throughout the entire course. Our mentor has been especially helpful and has really gone the extra mile to make sure we understood the material well.

The course book. Although I greatly appreciate the effort made to teach the course, the direct teaching has been unsatisfactory. Hence the course book has been invaluable for my studies.

That the teachers were engaged and friendly, and that the teachers responded well to feedback provided during the course.

The lectures was fun

I gained a deeper understanding of calculus despite my severe lack of background knowledge, having not ever seen most of the calculus topics discussed in this course before. Also, Despite covid circumstances all professors and staff have done their best to make it work.

I appreciate the passion that the teachers and some TAs had for the course and teaching it. It really inspires student to want to learn more and get motivated.

I found a mentor group really helpful when we were either working on the assignments or just seeking for a help. I could therefore, have clearer understanding on the topics we study.

The math

I enjoyed being taught by people who clearly enjoyed the topic and were able to show its relevance to different areas of mathematics.

The mentor groups.

What do you think should be improved?

I think the lecture notes was not enough for me to get through the course, I had to look for information elsewhere for almost every part of the course. I think the lay-out was good (that the chapters starts with information, that there were "boxes" with information and explanations, the reading exercises etc.) BUT it didn't really work for me since the actual information was not enough for me to understand the approaches and methods. I would appreciate more basic information, more basic exercises (so you can see if you actually understood the basics before moving on to doing more difficult ones) and more step-by-step solutions to all exercises. For me it's really important to at least know that I got the correct answer and there were a lot of exercises that didn't even have a solution. The exercises in the lecture notes were also very hard in my opinion. Even after being done with the course I can't do more than like 30% of the exercises in the lecture notes. So as I said, more basic exercises that tests your basic/general knowledge as well. I also think that the problem sessions might be a bit "unfair" for some students. I, for example, did not attend lectures a lot and focused more on studying by myself and when our mentor group were supposed to do the problems for the problem sessions there were some people that had to present problems a lot more than others just because not all of us attended the seminars regularly. If you want to study more by yourself it's hard to attend the seminars and present if you've made up a plan that you want to follow. This gives the result that some student take a bigger workload to present stuff at the seminars since not all members of the mentor group attends the seminars.

Mentors should try to schedule meetings at least a week in advance, and always plan for a (relevant) meeting ahead of scheduled problem presentations at seminars. An earlier publication of the weekly worksheets might help in that! However, one group meeting per week is more than enough for me personally, given good planning.

The textbook can have more solved examples especially for the more advanced problems, and also have more content and details about how to solve problems.

One thing that was hard for me was that I had to get used to two teaching methods and I think that if we keep one teacher per course it will be better.

The collaboration in mentor groups.

There should be more interaction between students to deepen understanding through, or example, SI meetings.

The mandatory part of the group meetings should be removed. They didn't do anything for me personally.

A final version of the course literature would help a lot. I thought that it was hard to separate if I did not fully understand, it was a mistake in the literature or something that would make sense later in the course.

Teacher students did not get to do the assignments and therefore did not get any personal feedback during the course. Although we were expected to pass the same exam as the bachelors' students, therefore have the same amount of knowledge for 13hp instead of 15hp.

I think the homework assignments were better during the first half of the course, since the workload automatically became pretty evenly distributed between people.

More communication/offers during the second part of the course. I felt very alone with the material.

I didn't follow through all the lectures so it is kind of hard to say. I had all the resources I needed to learn on my own. The different proof methods for deep theories, so that the reader easier can comprehend

Course litterateur. The exercises were really hard, it was difficult to move on to hard exercises without some basic ones.

Nothing that I feel needs to be improved.

The recording of the lectures was a trouble where sometimes the recording camera would go out of focus or the lecture was done on paper and we needed to change papers to look at previously written notes or the teacher needed to move the camera to see all of what they have written.

It was hard to pay attention and focus.

Maybe the switch from one teacher to another, since they had pretty different ways of teaching the course. Also, maybe not have proofs as exercises for the reader or at least include more hints for them.

It is a nice concept that proves are left as exercises in the coursebook. But once you do not see the trick, you can be quite stuck for a long time. I know that there were ways to get answers to this (seminars) but sometimes you just do not have the time to cover everything since the course material goes with a very fast pace. Therefore it would be helpful if there was at least access somehow to the answers of these exercises when one looks over the course material later.

Seminars, I felt like most of the time we were just shown how a problem is supposed to be solved but without explaining why we were supposed to solve it like that or how to think when tackling similar problems

Some PhD students grading the hand in assignments give very minimal feedback.

I think the workload of the course has been too light. With teaching moving online, the fact that we are studying starts to feel more surreal as time moves on – people study less (effective hours) than they otherwise would. Hence I think that increasing the amount of assignments would greatly help people stay, in lack of a better formulation, on track.

I do not think we have been properly taught how to answer questions. On the final exam I found that the amount of specificity required to achieve full points was not consistent, moreover the questions leave some things up to interpretation, i.e. question 4 (I think) on the latest final where it was not clear that one should write word by word where the function changed behaviour.

I think the most important thing to be improved is the course literature. I know J-F has been editing the compendium, but in spite of the corrections and other changes, I don't think the material is presented in a pedagogical manner. I think formal definitions of concepts, such as the limit, are provided much too late after informal definitions are introduced and the concepts are worked with in exercises. I also think proofs of theorems should be provided as soon as they have been stated. Providing formal definitions and proofs much later prevents the build-up of proper understanding and correct intuition for the new concepts. Moreover, I think complete and rigorous proofs of all the main theorems should be provided in the compendium - most students are not able to fill in the details by themselves and need to be led by example. I also think that the inverse function theorem and implicit function theorem with complete proofs should be included in the course, because even if they will be proved in later courses, it is difficult to build understanding of this course without seeing their proofs.

I think many definitions could be stated with more clarity. In general, I think definitions should be clear enough that one doesn't need to look at examples to guess what the definition is meant to be.

I think the course would benefit if some content was removed. In particular, I think it would be a good idea to remove the Python chapter and ask the programming teacher to include some exercises on converging and diverging sequences and series in the Python course instead. I also think it is pre-mature to introduce second order linear ordinary differential equations with constant coefficients, because a rigorous proof of the solution method "requires" the introduction of differential operators as well as complex functions. I think it would be preferable to only cover separable ODEs and first order linear ODEs.

The content I would like to be added the most to the course would be rigorous definitions of the elementary functions that we work with throughout the course. It is quite unsatisfying to do other things with rigor when the exponential and trigonometric functions that we work with a lot have not been properly defined. In the last chapter, it should be possible to directly define these functions as the limits of their Taylor series. It think it would also be nice to include the uniform limit theorem in relation to this.

it seemed like the teachers were short on time when finishing a lecture so maybe less information per lectures or longer ones.

Maybe providing more but smaller assignments, like weekly instead of larger biweekly assignments. I know for most people it is not preferable but I think more tasks that cover all subjects would be preferable.

Some parts of the lecture notes is not comprehensible without some prior knowledge. Some stuff I understood after I watched the pre recorded videos on youtube by JF or other sources. Other stuff were just written in an overly complicated way and couldn't find a way to understand them even with the help of online sources. Another complaint I have is the mentors. I know friends who are in different mentor groups which I decided to listen to their meetings and

thought that it was unfair to have my mentor who was utterly unorganized and didn't know what to do while other mentors gave lecture like meeting to their groups and proved to be very useful. I found my mentor meetings to have been a waste of time.

Zoom lectures need to be improved by a really large margin because it was unbearably boring.

I would suggest the seminar teachers to have more consistent lecture/ sessions. I found some seminars very clear and informative but others were a little unorganized in some way.

Some of the seminars were very unclear where a few of the TA's (excluding Tien) weren't as pedagogical to be beneficial for the students learning.

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

No

Nope!

Not at all.

Not at all.

No

Nope.

No, I have experienced no discrimination.

No

No.

No

oh. uhm, there's always mansplaining but compared to the Physics department this was heaven

No, it was actually very well handled.

No, never

No

No

Bruh

The course literature was great and the staff was very engaging. How the lecture was done could, however, be improved.

No

No

No

No.

no

No

No. However, I did note that somewhere in the compendium (I don't remember which page or chapter), and once during communication, a person was referred to as "him" although it could have been a "her". I don't think this deserves to be called an issue, but the question reminded me of it, so I thought I'd mention it as something to keep in mind.

no

Not at all

None

N/A

No

No, but it might be a good idea for the teachers to use gender neutral terms when describing mathematical terms in an equation.

No

What further opinions about the course would you like to share?

I thought the second teacher was better than the first because he was a bit slower and has example problems during the lecture which was good for the understanding.

Maybe give some alternative course literature so that those who feel like the lecture notes doesn't suit them have a backup book that also works for the course, maybe just give some tips that "these books work good for this course as well", even though we might have to buy them ourselves.

I would also appreciate if you'd add some information about gender and gender equality since the majority of the participants of the course are men. I felt like there was some male dominance among my classmates. I sometimes felt like I was a bit silenced which made me feel less important and less good at maths (I'm a girl). Sometimes I also perceived it as for example, my ideas to solve things were just stupid even though it worked and I got the *tap on the head* "sweetie sit down, you don't know this"- feeling (this did not actually happen but it felt as if that was what the guys were meaning by silencing me). If you study physics I've heard that you have a like 3p course where you talk about gender equality which I think is very good, but since a lot of people in this course study the math bachelor they won't have that course. I think it's crucial to talk about gender equality, especially in a program where the majority is men.

I know that we had a lot of problems to do for homework and also in the lecture notes but I would like that homework part to contain more difficult problems because compared to exam they were different.

Both the organization of the course and the teaching have been great. If I had to highlight something negative, in my opinion, it would be the teaching pace that is a bit fast but this is because the syllabus is too extensive to cover in just four months.

It is a hard course.

More YouTube videos from Jan-Fredrik and more lectures with Eskil.

I liked the spam mails and the 20 new youtube videos a day in the beginning of the course.

The youtube videos really helped, and the compendium was overall nice to have

I liked it.

Gr8 job m8

Thank you for teaching me the material of this course. When I first saw the course literature I would never have guessed I would be able to cover it. The learning curve was very big and I really feel I got a lot from it! It's a great course! Maybe the overall results of the final exam should also be published, like for the midterm.

To be frank, it was a stupid idea to change the main teacher mid way through the course. Don't get me wrong, both are good teachers that I would gladly have in another course, but the reassignment to the different teaching styles, at the very least, caused my ability to learn from those lectures to decrease for a time. Moreover, using pen and paper for online lectures did not work too well, what Tien did with the blackboard was much better, but I understand that circumstances might have made pen and paper the only viable option.

I think that there is a long gap between finishing the compendium and taking the exams. It would be nice if there was an option to take both exams before Christmas. Unless one studies during Christmas, there are several weeks to forget the details of the course. It would be much nicer to go on Christmas break after finishing the exams.

I think it would be better to take a course in algebra before taking analysis. Most importantly, I think the motivation for real analysis suffers a lot when the real numbers have not been constructed. In particular, I think it would be more illuminating if the Dedekind completeness of the real numbers was proved as a property instead of taken as an axiom. It would also be preferable if the complex numbers had been properly constructed and the fundamental theorem of algebra properly proved. If this was already done, it would not be as much of a stretch to cover second order linear ODEs with constant coefficients, and partial fraction decomposition would be better motivated. Since understanding these number systems requires a bit of time and work, it seems better to cover them in a separate course rather than trying to cram them into the beginning of the course, which is why I think a course on algebra would be a better start.

A little hard for me to understand personally but fun when I did understand and could use the methods

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Give an idea to students on how different the course is going to be from highschool math. Since in highschool, one did not need to prove stuff which have been considered to be trivial.

I would like to appreciate all the professors, seminar teachers, and mentors for making this year's course possible during this hard time. I could never manage my studying process without all the supports and instructions from you. Thank you so much.

As for the transition to completely teaching online. I think it was technically done well in terms of still letting students interact in the lectures and bring their questions in. I just wanted to mention that nonetheless I found it very difficult to absorb and maintain the same amount of information from the lectures compared to the lectures in campus. I think this de-

depends on learning styles of individual students, I just wanted to comment on my answer in the questionnaire about this. I just wish there were more solutions to follow and more worked examples. If you hadn't quite grasped a concept or a procedure yet it would hurt you in the long run and it was difficult to go back to previous exercises and refreshen your memory.