

Integration theory: Introductory Information for first day

Welcome to the course!

My name: Jeffrey Steif (steif@chalmers.se)

Some of the Goals:

- (1) General Measure theory including Lebesgue measure
- (2) General integration theory including the Lebesgue integral and convergence theorems
- (3) Strong Laws of Large Numbers
- (4) Lebesgue's Decomposition Theorem and Theory of Differentiation

Lectures and exercise/discussion sessions: We will have about 70% lectures and 30% exercises/discussion sessions. The latter will be a mixture of (a) going through various exercises, (b) discussions and clarifying difficult points and (c) sometimes going through material which we did not have time for.

For the lectures, I will be using the "slides" which are already on the canvas homepage.

Literature:

- (1) Lecture notes written by me and which we will follow very closely. (Read and study in advance!). You are not required to know subsections where it says "An interesting aside".
- (2) Real analysis by G. Folland (abbreviated F)
- (3) Lecture notes by Johan Jonasson (abbreviated JJ)

Exercises:

As you should know by now, mathematics is **not** a spectator sport! Besides studying the material, it is absolutely crucial to work on as many problems as you have time for in order to develop a mastery of the material. There are 3 sources for the exercises. (1) and (2) should be prioritized.

- (1) There are exercises contained in the lecture notes as you read.
- (2) Suggested exercises from Folland listed on the homepage.
- (3) A further list of exercises written by me on the homepage.

Grading:

The **grade** is based on an oral exam. See the homepage for more details.

Online teaching:

Emergency number (0702298318). If the internet breaks down and I do not notice.

- This is the second time I am giving this course online. You should therefore feel free and are encouraged to give me constructive criticism throughout the course concerning any issues that arise.
- During the zoom meetings, of course your sound needs to be off.
- While not required, I would prefer if your videos are on (unless this causes broadband problems). In this way, I can feel that I am lecturing to people as opposed to an empty room. The lectures will not be recorded (privacy issues, people will feel more free to ask questions, etc.).
- Questions during the lectures are strongly encouraged. People can also use the chat and I will try to look there but this might be difficult if there are too many such posts. Another alternative is that other students try to answer the chat questions if they can while I keep lecturing.
- For the exercise/discussion sessions, I thought it would be most helpful to you if you have a vote in what we will do. Therefore, any time after the lecture proceeding the exercise/discussion sessions but at the latest the day before the exercise/discussion sessions, you can email me (at steif@chalmers.se, not through Canvas)
 - (1) which exercises you would like to see solutions presented for (we will certainly not have time for all) and
 - (2) any questions concerning what we have gone through previously that you would like further clarification about.

I of course cannot promise I will get to everything but I will choose things to satisfy the majority of the people.

- If you are a mathematical statistics student and taking this course to improve your knowledge of probability theory, then I strongly recommend you look immediately at Section 6.1. While it is true that the definitions there come from the measure theory that we will have studied earlier, the section can hopefully provide some context and allow you to understand/absorb the measure and integration theory from a "probabilistic" point of view. This hopefully will motivate (from a probability point of view) the various concepts we study and provide a framework on how to think about things.
- During the course, if you want to discuss things, I am happy to have zoom-office-hours (<https://chalmers.zoom.us/j/63021151829>). Just email me with three suggestions of times and I will choose one. However, I am much more inclined to do this if you attend the lectures, and I am less inclined to help in this way if you do not attend. In addition, although all the material is in the notes, I would think that the lectures would provide further context and understanding. Of course, attending lectures is not obligatory.
- Mathematics is most fun and educational when working together. So, I strongly encourage you to try to work together. If people want to be part of a group which discusses things with each other, you can email me and tell me that. I can collect the names and mail everyone in the group. But beyond that, I do not participate in any organization of it.
- It is your responsibility to read all the announcements. Perhaps you can set things up so that you get an email each time.
- 2 class representatives needed. Ideally one from Chalmers and one from GU. (Very little work).