



Zurich Fall 22 — Dynkin, Limmat, Nachtseminar

Preparing for exchange

I was drawn to exchange studies for all the obvious reasons and since I had heard good things about the academic rigor in Switzerland, I decided to apply to ETH, a well regarded institution in the German speaking part of the country. I figured it would be an opportunity to refresh my German, enjoy the mountains and take tough courses. Preparations were quite lengthy, with lots of required documents, including a personal statement sent to ETH after the nomination by KTH. Once in Switzerland, the school was a lot less strict with formalities.

Arrival

I arrived on September 1st, a few weeks before the beginning of the academic term. I took this opportunity to take part in a German language course, mostly for meeting friends. My student house is quite well known for housing 169 students all sharing one kitchen. I made a lot of friends in a very short amount of time. ETH offers very little in the way of an organized reception (a few lectures and an apéro), but this was for the better from my point of view. It was possible to go swimming in the Limmat river until early November, or hike with one of the groups organized spontaneously during the language course, so a more structured reception was not missed.

Personal finance

I received some sort of Erasmus+ grant. Zurich is the most expensive city in Europe and a weakening SEK did not help. Having worked during the summer months helped tremendously, since my burn rate was way above my income during the semester. Expect to pay 65-70 crowns for a good Cappuccino.

Housing

I lived in a somewhat rougher part of town in Meierwiesenstrasse 62, a student hostel. It was a great experience and I would highly recommend anyone who gets a spot there to accept it immediately. I know some people who tried to set up their living situation independently and it seems like a real struggle.

The university

ETH is a big university. I was an exchange student within the Mathematics Department. The studies are theoretically oriented and more focused within the respective degree programmes. Students of mathematics study mathematics almost exclusively (it is still possible to change to the physics track after one year, but this says more about the physics programme). The ETH math department uses oral exams in many courses. At a KTH exam you can expect some easy exercises, some medium exercises and perhaps one exercise (usually the very last one) that requires some creativity. Such exams test your problem solving ability. Oral exams are not about solving problems. Instead the professor picks two-three proofs and you are then asked to prove them on the blackboard. There are some follow up questions and sudden jumps to a completely different topic, perhaps the sketch of a few other proofs and then it's over. This tests the ability to synthesize large volumes of information, appreciate connections between disparate topics and recall it within seconds.

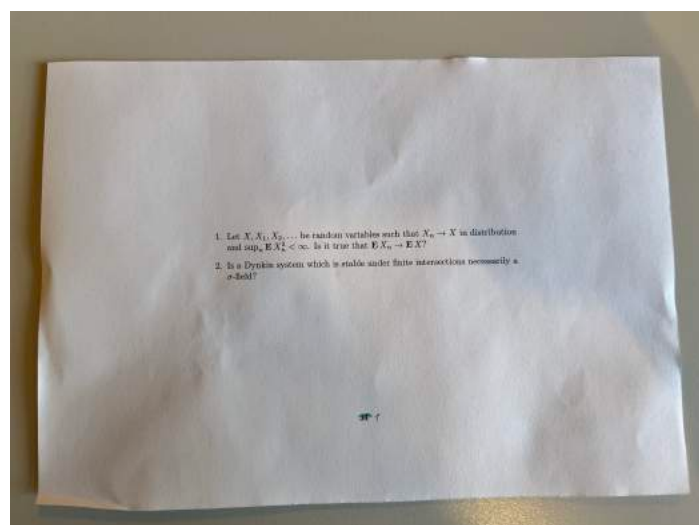
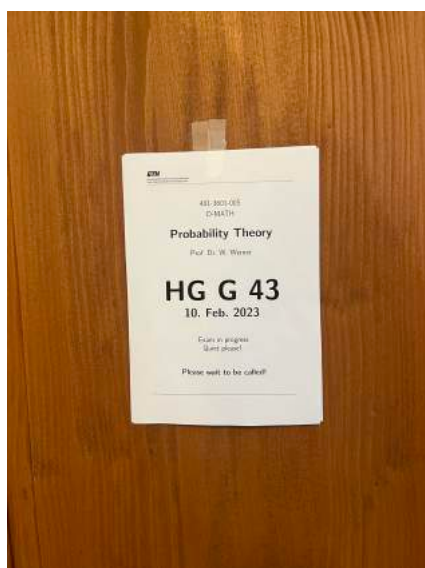
Courses

Complex Analysis: A core undergraduate mathematics course. Students are introduced to holomorphic functions and their many surprising properties. It starts out somewhat artificial, with many of the same calculus operations one knows from the real counterpart, only with the added structure of complex numbers, but quickly gets interesting. The theory of conformal equivalence and the proof of the Riemann mapping theorem was my favorite part.

Measure Theory: Introduction of pre-measures, measures. Lots of Caratheodory: Theorems and criteria for measurability. Hausdorff measures and dimension as an important generalization of Lebesgue measure. Measurable functions, integration, product measures and a hint of differentiation of measures. Egoroff's and Lusin's theorems are quite nice. Take this course if you want to i.) feel completely at ease with integration and ii.) broaden your horizons regarding the problem of assigning values to sets, especially those with geometric structure. The oral exam featured Minkowski's inequality and Fatou's lemma (from first principles, without monotone convergence). I was then asked to give an example why non-negativity of the functions is necessary.

Control Systems: Transferred as Reglerteknik. Charismatic teacher. This is about engineering and getting things to work, somehow. For those interested, there is also an opportunity to program flying drones, implementing the control policies covered in class.

Probability Theory: A 10 credit monster of a course and a formative experience. Starting from abstract generalities, some measure theory, lots of Dynkin systems and then progressively building to discrete time stochastic processes, martingales, four (!) proofs of SLLN, and ending the course on the topic of weak convergence, CLT, Stein's method and some large deviations principles, this is an essential course for students interested in probability. In the third week, the exercise sheet featured Etemadi's strong law of large numbers, proved as recently as 1981. The sheet contained only three-four exercises, generally quite difficult ones. The picture below shows the paper from the oral exam. I had a generous 20 minutes to prepare my answers. After presenting, I got further questions concerning construction of conditional expectation by Hilbert space projections, Lévy's theorem on convergence of characteristic functions, with tightness or with limit function continuous at 0. Then I sketched Prokhorov's theorem (in the special case of real numbers) assuming Helly's selection theorem. The best course and exam of my life so far. This course is not possible without Foundations of Analysis (SF1677) (another amazing course, every spring at KTH).



Other activities

