



EXCHANGE REPORT

Name

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Year and semester for exchange

HT23 (Fall semester), 2023/2024

Exchange university

ETH Zürich

Degree programme

Engineering Mathematics

(Master's in Applied Mathematics)

ETH Zürich is a very cool university and I am happy I did my exchange there

Before departure

My choice to apply for an exchange to ETH Zürich was, to be blunt, primarily founded on its stellar academic reputation. ETH Zürich has world-class researchers and scientists in its employ, and is regularly ranked among the top 10 universities in the world by several sources. Furthermore, for me as an aspiring mathematician, it was exciting to be at the same institution a diverse range of mathematical superstars, both current (e.g. Alessio Figalli, Fields medal 2018) and past (e.g. Albert Einstein, Georg Cantor, John von Neumann, Lars Ahlfors etc). As my mother is German, I am natively fluent in German; this is an aspect I also thought would be of use in a nominally German-speaking city such as Zürich, but more on this later.

Upon arrival

I arrived approximately a week before courses started with grand plans of exploring the city and surroundings. I had also planned time for administrative tasks (such as registering your residence with the authorities) and menial tasks such as procuring a wall outlet adapter and phone plan. I advise any prospective exchange student to plan some time before classes start, as there will be some tasks to do. Also, surprisingly much in regard to authorities (coming from Sweden at least) is done in person and can not be done online. Immediately upon arrival, I caught a massive cold, so I spent a large part of my first week in bed drinking tea. I did the tasks I had to do, but unfortunately did not have much time left over for exploring the city.

Financials

Zürich is an expensive city compared to Stockholm. In general, Switzerland is more expensive than Sweden, but this effect is noticeably greater in Zürich. I received the Erasmus+ scholarship from KTH, which replaces the prior SEMP scholarship; this scholarship (as far as I understand) is part of some EU-Switzerland agreement and is given to any KTH student undertaking an exchange from Sweden to Switzerland. I was also fortunate enough to receive a scholarship from the Heyning-Roelli foundation, which supports academically gifted students from foreign universities undertaking exchange programmes at Swiss universities as well as Swiss students undertaking exchange programmes at foreign universities. The application for the Heyning-Roelli scholarship was comparatively involved (for instance, I had to submit screenshots of my bank account to support my claims of financial need), but it was well worth it, as the Heyning-Roelli scholarship more than covered my full rent for the entire exchange. Although relatively selective, I think anyone selected for the exchange to ETH by KTH has a very good shot of receiving this scholarship, and I recommend anyone in this position to apply. Note that the deadline is relatively early: For the fall semester, if I recall correctly, applications close 20 April the same year.

Accommodation

My accommodation was a dorm room in a large student hostel building owned and operated by WOKO, the student-run student housing association. If I recall correctly, I applied by way of a form sent out as part of the application process by the university. WOKO operates several housing arrangements; mine was in Meierwiesenstrasse 62 and was okay. It was cheap (for Zürich anyway, approx. 700 CHF per month) and relatively accessible (about 30 min by tram through the beautiful city of Zürich to the ETH main building). The main downside for me was the kitchen, which while massive (ca 20 stovetops) was shared by all 160 or so students living there, and so could be quite crowded around major meals. All in all, though, I am quite happy with the value proposition of my living arrangements. Almost everyone I know who was on exchange at the same time as me also had accommodations through WOKO, with the exception of one friend who found a Wohngemeinschaft (i.e. shared apartment).

I would strongly recommend applying to WOKO. It seems they prioritize exchange students, and I have not heard of anyone on exchange who wanted accomodation but did not get any via them. If you are lucky, you might even get a room in Beugi, as a few of my friends did. There, WOKO operates an old converted elderly care home as a student hostel (i.e. own rooms but shared kitchen). I spent a lot of time there and it seemed homier than the WOKO facilities at Meierwiesenstrasse 62.

University and studies

I am sure most readers are aware of the academic reputation of ETH Zürich also in terms of studies, and my experience more or less fully supports this reputation. At least in the Department of Mathematics (where I spent my time), courses are more theoretical, at a higher pace, assume a greater amount of prerequisite knowledge, and assume more commitment to independent study than a typical course at KTH. When talking about my experience to fellow KTH students, I have on several occasions explained it by stating that the courses I took at ETH were not necessarily harder than the hardest courses I had taken at KTH (among others SF1977 Foundations of Analysis), but that ALL or at least most courses I took at ETH were at that level of difficulty. That is, all courses I took at ETH were as difficult (not more difficult, mind you) as the most difficult courses I have taken at KTH. All courses I took were given in English. This included some courses that were technically aimed at Bachelor's level students and so were not guaranteed to be in English. I recommend to any prospective student to ensure that his or her courses of interest are given in a suitable language. The course catalogue (<https://www.vvz.ethz.ch/>) includes information on the language that courses are given in, as well as content, duration, number of credits and so on.

Courses

In total I took five courses worth a total of 34 ECTS credits over the course of the semester. I will outline these one by one below. Before arrival, I had planned to take 26 ECTS credits, but after a few weeks I joined a couple of friends in the fifth course, which with hindsight turned out to be my favourite of the bunch. That is to say, keep an open mind about your selection of courses in the first few weeks. It is encouraged to sign up to more courses than you intend to complete, and you can drop courses without penalty up to some deadline relatively late in autumn.

Differential Geometry I This course was given by Professor Tom Ilmanen and was worth 9 ECTS credits. Professor Ilmanen gives lectures that are very entertaining and he is extremely charismatic and humorous. I really wanted to like this course, because differential geometry is super cool. Unfortunately, Professor Ilmanen had a very American way of hand-waving at technicalities and drawing pictures instead of explaining proofs that clashed with my way of understanding mathematics, and so I had an especially hard time gaining useful information from the lectures. This is a shame, because they were very funny. All in all, I would still recommend the course, but be prepared to put in a lot of effort and time outside of lectures.

Functional Analysis I This course was given by Professor Marc Burger and was worth 9 ECTS credits. Professor Burger has the aura of a cool no-nonsense uncle in a very French way. That is to say, he is witty, detailed in his explanations, very structured in the way he presents his lectures (definition, theorem, proof, repeat), smokes a cigarette in most breaks and usually wears a very stylish cardigan while doing so. Content-wise, functional analysis can be thought of as generalizing the tools and results of linear algebra: Essentially, it is to higher mathematics what linear algebra is to undergraduate mathematics. As such, this course is one of the most useful courses I have taken, and I highly recommend it.

Nonlinear Dynamics and Chaos I This course was given by Professor George Haller and was worth 4 ECTS credits. Professor Haller was very good at interleaving theory with an intuitive view, more often than not supported by a detailed sketch or picture. This course was very cool and I learned some cool new things (center manifolds and perturbation theory, for instance), but with hindsight, I should have dropped it. This is nothing against the course itself, only the logistics around it. Frankly, it requires more work and covers more material than is proportionate to the number of credits, and I ended up spending a lot of time on this course that would have been better spent elsewhere. At the same time, it had some overlap with a previous course on ODEs I had taken, and so did not reach quite as deep into the field as I had hoped. I recommend it to anyone interested in dynamical systems but who has not previously had too many studies in differential equations.

Smoothing and Nonparametric Regression with Examples This course was given by Professor Rita Ghosh and was worth 4 ECTS credits. I really liked this course. It chiefly concerned estimation of probability densities given samples from said densities and discussed in detail many methods for this that did not assume a parametric form of the densities. The course had exactly one lecture per week (always at the same time, Friday afternoon), no homework, no labs, and a very fair concluding oral exam. The class was tiny (I think we were 20 or so); the lectures were very cozy and Professor Ghosh was very kind. For the last lecture before Christmas, Professor Ghosh brought christmas cookies for the entire class. I strongly recommend any course given by Professor Ghosh and this one in particular, as it is plainly a nice time and does not take a lot of effort from your other endeavours.

Mathematics of Data Science This course was given by Professor Afonso Bandeira and was worth 8 ECTS credits. This course is my favourite out of all courses I took during my stay at ETH. Nominally about the mathematics underlying modern data science techniques, it covered a wide range of super cool topics mostly at the intersection of probability theory and linear algebra, such as high-dimensional statistics, random matrix theory, graph theory, concentration of measure, etc. Professor Bandeira has a way of developing concepts step by step in a very clear way and asking us students in the audience exactly the right leading questions so that it feels almost as if one could have discovered the results on ones own. A friend credited this course with reigniting her love for mathematics. I highly recommend this course to anyone with even the slightest interest in probability theory.

Having written extensively about all the courses I took, I should remark that I think it reflects extremely well on the quality of the courses and Professors at ETH Zürich that I have basically wholeheartedly recommended all the courses I took, even if some were recommendations with caveats. In all, I am extremely satisfied with the academic aspect of my exchange.

City and country

Zürich is a beautiful city and Switzerland is a beautiful country. There is really nothing negative that I could say here. The city has a lot to explore. One thing I really enjoyed was the abundance of independent cinemas (Riffraff, Houdini, Arthouse Le Paris, etc). I also frequented the main theatre Schauspielhaus Am Pfauen as well as the Opernhaus. My time in Zürich coincided with fall and winter, and Zürich really shines during these seasons. In winter, most of the city turns into a Christmas market and there are stands where you can buy Glühwein. Also, there are really nice museums: Two I enjoyed in particular were the Landesmuseum (which details the history and culture of Switzerland) and the art museum Kunsthaus, which has free entry on Wednesdays. One other facility I would like to highlight in particular is Frau Gerolds Garten, which is a nice outdoor garden type area serving food and drinks. I took my mother and sister there when they were visiting, we sat outside on sheepskins by the flaming braziers and enjoyed some Glühwein and Raclette.

On language: As I mentioned in the first section, I am fluent in German and I had some preliminary view that this would help me a lot in nominally German-speaking Zürich. Not so (at least not in the way I had thought). The Swiss-German dialect is markedly different from the German I know, to the extent that I had major trouble understanding spoken Swiss-German. It was somewhat helpful to be able to speak German in particular when interacting with the authorities, however.

Leisure and social activities

Beyond what I have discussed in the section above, ETH has many student societies of all different sorts. I also particularly enjoyed the Ersti-events for incoming students during my first week(s), which included such things as a barbecue event with free bratwursts and beer, as well as a massive clubbing/festival event at the Hönggerberg campus, complete with multiple music genre-specific tents. My favourite ETH club was the cinema club Filmstelle, which organizes regular screenings of classics, old as well as modern, every Tuesday. A tradition developed where I and a group of my friends would frequent these every Tuesday as a nice interruption of the regular week's ennui. However, ETH offers many more clubs for all types of activities, such as the student-run sport club, a wine-tasting club, a photography club, a quantitative finance club, etc. In short, there is something for everyone and I had a great time.
