



TECHNISCHE UNIVERSITÄT
CAROLO-WILHELMINA
ZU BRAUNSCHWEIG

**A GUIDE FOR ELECTRICAL ENGINEERING EXCHANGE
STUDENTS AT TECHNICAL UNIVERSITY BRAUNSCHWEIG,
GERMANY**

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1 WHY COME TO BRAUNSCHWEIG?

Before getting into the details of the school system in Technical University Braunschweig (TUBS) and the work term opportunities in Germany, this section provides a brief overview of the main reasons that have motivated students in the past to participate in the Braunschweig exchange.

1.1 Language & Culture

Choosing to go overseas and study engineering in a foreign language does require some courage! However, it is not as bad as it sounds! Being immersed into this new environment will speed up the learning process by a ten-fold. Already by the end of the first academic term you should notice a significant improvement in your comprehension of the German language.

Use the opportunity to learn more about German history and the culture. Most people limit their knowledge to the WWII period but Germany's cultural heritage is so much more than this. After all, knowing about the past helps understand the structure of today's society as well as contemporary German thought and culture.

1.2 Education & Student Life

The exchange gives the opportunity to explore a totally different school system. German university system is somewhat unstructured compared to the Canadian system. Both have their distinct advantages as well as disadvantages, but it will be up to you to discover which one you prefer!

Get involved outside of school! One of the nice things about the German system is the free time outside of class. So pick up few extra curricular activities and get to know the German student life a bit better.

TUBS offers a wide range of sports and physical activities. Learn sailing or horse riding or join one of the cool team sports such as ultimate Frisbee. This is a great way to meet new people and practice the language. For those that are not into sports, there is always the possibility to sign up for a language course and pick up yet another foreign language or to join any other student/research groups on campus.

There are relatively a lot of social events going on campus: annual student parties such as "Schuntember" and "Maifest" in Schunter residence, "Hoffest" in Michaelishof etc. There are also student events that take place relatively often in Audimax (one of the buildings on the main part of the campus). There are weekly movie nights in Audimax and Schuntille, as well as pub (Kneipe) evenings in both Schuntille (student run pub in the Schunter residence) and Michaelishof.

1.3 Traveling

Even if not originally planned for, most students end up traveling quite a bit. The relatively light schedule (in comparison to the Waterloo schedule!) will allow you to organize short weekend trips whereas the breaks between the two semesters can be used for longer adventures. Remember to plan well ahead of time. Booking the train or plane tickets couple of weeks in advance can get you really good deals. Also, consider traveling with other exchange students, not only is this more fun but, especially for the train tickets, it is possible get up to 50% discount when traveling in groups. For longer relations, companies such as Ryanair, German Wings, Easy Jet etc offer cheap airplane tickets.

1.4 And most importantly...have fun!!!

No matter how you decide to spend your year abroad, the most important thing is that you enjoy yourselves. Whether your focus will be on learning the language, taking engineering courses that you may not have the opportunity to take in UW, traveling or simply staying in Braunschweig and getting to know the people and the city, all these things is what will make your exchange year a memorable one.

Upon return to Waterloo you will realize how much you have accomplished, learned and seen and I am positive that you will have no regrets having taken part in this adventure.

2 TECHNICAL UNIVERSITY BRAUNSCHWEIG (TUBS)

Primarily an engineering and science oriented school; (TUBS) is organized into eleven different faculties.

- Mathematics and Computer Science
- Physics and Geoscience
- Chemistry and Pharmacy
- Biosciences and Psychology
- Architecture
- Civil Engineering
- Mechanical Engineering
- Electrical Engineering and Information Technology
- Humanities and Educational Sciences
- Business Administration, Economics and Social Sciences

Each faculty is broken down in several institutes which concentrate on a specific discipline. The focus of this section is to provide additional information on the institutes in the Electrical Engineering Department. Although in the past, the majority of the students that have done the exchange program at TUBS are either mechanical or civil engineering students, Electrical Engineering program at TUBS is very diverse and offers a lot of interesting EE courses.

The Electrical Engineering and Information Technology department is further divided in eleven different institutes:

- Institute of Computer and Communication Network Engineering
<http://www.ida.ing.tu-bs.de/>
- Institute for Electrical Machines, Drives and Traction
<http://www.iem.ing.tu-bs.de/>
- Institute for Electrical Measurement and Fundamental Electrical Engineering
<http://www.emg.ing.tu-bs.de/>
- Institute for Electromagnetic Compatibility
<http://www.emv.ing.tu-bs.de/institut/>
- Institute of Electrophysics

<http://www.iep.tu-bs.de/>

- Institute of Semiconductor Technology
<http://www.iht.tu-bs.de/>
- Institute of High Frequency Technology
<http://tu-braunschweig.de/ihf>
- Institute of High-voltage Technology and Electrical Power Systems
<http://www.htee.tu-bs.de/>
- Institute for Communications Technology
<http://www.ifn.ing.tu-bs.de/>
- Institute for Elektronische Bauelemente und Schaltungstechnik
<http://www.nst.ing.tu-bs.de/>
- Institute of Control Engineering
<http://www.ifr.ing.tu-bs.de/>

2.1 German School System

The university system in Germany consists of two levels, Grundstudium and Hauptstudium. Completion of these two levels leads to the Diplom. Diplom is somewhat similar to our Masters Degree although not 100% equivalent. As an exchange student you are allowed to take both Grundstudium as well as the Hauptstudium level courses. Grundstudium courses are similar to our first two years, they cover basic engineering courses, whereas Hauptstudium courses are much more specialized and correspond to the equivalent of our 4th year courses or masters' courses.

2.2 Course Equivalencies

Other than the language barrier, the most common reason why students decide not to take part on an exchange is because they are afraid of the potential delay in completion of their undergraduate studies. The table below gives an overview of the courses I have taken during my exchange in TUBS for the 3B/4A academic terms.

Course Name / Code at UW	Comments on TUBS Equivalencies
Core courses 3B/4A	
ECE 362 - Energy Systems And Components 2	02106 – Control of electrical drives pretty close match, more focus on controls than in ECE362

ECE 318 - Communication Systems	10109 – Signal Transmission II It is NOT a perfect match. ECE 318 focuses more on analog communication systems. I suggest trying to find a better match or taking the course upon return in 4B.
ECE 471 - Electromagnetic Waves	09102- EM Waves (closer match) or 09305 - High frequency transmission technology
ECE380 - Analog Control Systems	02100 – Fundamentals of control engineering very close match to ECE380
ECE 332 - Electronic Circuits	Taken in UW upon return in 4B A possible equivalent course would be 03115 – Electronic devices and analog circuits
4A/4B Technical Electives	
ECE 411 - Digital Communications	10109 – Signal Transmission II I took course originally as credit for ECE318 but credit for ECE411 instead.
ECE 412 - Coded Digital Communications	10201 – Coding Theory close match to ECE412
ECE 413 - Digital Signal Processing	10303 – Digital Signal Processing very close match for ECE413
ECE 414 - Wireless Communications	10202 – Principles of Mobile Communications very close match to ECE414
SY DE 575 – Image Processing	10304 – Digital Image Processing very close match to SY DE 575

All the technical courses that do not have a UW equivalent will be given a Gen E credit. An important thing to remember is that only two of non ECE technical electives (TEs) can count toward the 6-TE graduation requirement.

2.3 Registering for courses

One of the particularities of the German post-secondary system is the increased flexibility students have when it comes to choosing and registering for courses. Although they have to complete a defined set of courses for their Grundstudium the faculty does not enroll them automatically in these courses or any courses thereafter.

Therefore, all that needs to be done at the beginning of the semester is to go on the faculty webpage, look at the courses schedule to choose which courses of interest and simply attend the lectures. The registration for certain labs is sometimes mandatory, depending on the course.

Students only need to register for final exams. This registration form is available online and typically needs to be filled out one month before the beginning of the exam period.

The two documents that need to be filled out can be found under this link:

<http://www.tu-braunschweig.de/fb8/studierende/pruefungen>

The first document is called "Stammdatenbogen". This provides only the general information about the student and needs to be filled only once, i.e. for the first exchange term.

<http://www.tu-braunschweig.de/Medien-DB/fb8/stammdatenbogen.pdf>

The second document is a list of the courses for which you would like to challenge the exam. Both oral and written exams need to be listed on this sheet. Labs or computational labs that have no exam should not be listed in here. For these types of courses, a certificate (Schein) is normally given, which states that you have completed the lab/exercise.

http://www.tu-braunschweig.de/Medien-DB/fb8/AFS-i7000101_MeldebogenET.pdf

If you need any help with the forms, or with course selection you can always seek help at the EE department (Elektrotechnik Fachbereich). The academic advisor there is very insightful and will gladly assist you.

2.4 Exams

The exam period in TUBS is very long, typically ranging anywhere from five to seven weeks. The exams can be either written or oral exams. A course that is part of the Grundstudium will most likely have a written exam. The oral exam will be mostly for Hauptstudium courses where the number of students per class is relatively low and the professors find it easier in general to proceed with the so called oral exams (Mündliche Prüfungen).

2.4.1 How do oral exams work?

Towards the end of the term, for every class with an oral exam, the professor will typically offer two possible exam dates, one of them is normally at the beginning of

the exam period and the second one towards the middle or the end. All you need to do is to sign up for a time slot for one of these two days. The length of the exam varies anywhere between 20 minutes to an hour. Different professors have different way of examining students. Sometimes, you will be alone with the professor and a teaching assistant and they will ask either a series of questions or 3-4 questions from major topics covered in class. Other professors tend to prefer group exams so they will be doing exams with 2 or 3 students at the same time. In this case the professor would normally go around the table and ask each student a question.

2.4.2 Preparing for oral exams

The most important thing to remember is that, unlike written exams, oral exams are not about number crunching. The questions are going to be a lot more focused on whether the student understands the concepts and the theory or its application rather than whether he/she can memorize endless formulas. From my experience only very basic formulas have been expected.

2.4.3 The language barrier

All of the professors that I had to deal with were very understanding when it came to the language barrier. If you do not feel comfortable doing the exam in German, you can always approach the professor and ask him/her if it is possible to do the examination in English. Not all professors will agree to this, but in most cases they will not mind. Another thing that should be kept in mind is that by the end of the semester, since all of the notes are in German and the lecture has been held German, you might even find it easier to do the exam itself in German, rather than trying to translate all of the terms in English.

Students do not lose any marks because of the grammar mistakes that they make during the exam, and professors in general are glad that international and/or exchange students are trying to communicate with them in their language.

2.4.4 Moving the exam date

Written exams tend to be pretty late in the exam period. Especially in the summer term, when you will need to come back to Canada at the end of August, you might need to go and approach every professor whose exam you will not be able to write at a normally scheduled slot.

Most of the time, the professor will offer that you do an oral exam instead at a date that is convenient for you. Remember that they will reschedule the exam only if you have a valid excuse like the return to Canada or beginning of an internship. Do not try to reschedule exams because you would like to spend more time traveling, some professors may ask for a written proof from your school/company.

2.5 Marks Transfer

At the end of the second term, once you have completed all of the exams, you can go to the International Office. They provide a form that needs to be filled out in order to get the TUBS transcript sent back to Waterloo. You also need to go to the EE department (ET Fachbereich) and ask for your Transcript (Notenbescheinigung). Once all the professors have submitted the marks, they can either send it to the International Office or you can pick it up in person.

When handing back the papers to the International Office make sure that you also have the certificate (Schein) for all of the labs/computational exercises/language courses that you may have done over the course of the year.

2.6 UW Equivalencies

Upon return to Waterloo, you will need to make an appointment with a professor from the E&CE department who is responsible for the exchange equivalencies. In 2005/2006 this was Professor Aplevich. All you need to bring is a detailed outline of the topics that were covered in the course (the course outline that can be found on the TUBS website may not be enough). This outline should include the number of hours spent on each topic and whether there was a lab component or not.

Professor Aplevich will give the equivalencies only for the courses from the E&CE department. For any other department, the professor that is teaching that course in UW needs to issue a note confirming that the course you took has a UW equivalent.

In general, there is no need to show the notes/books of the courses took while on exchange (a detailed course outline as mentioned above is sufficient) but I would recommend bringing back the books/course notes anyways. If ever a problem arises with one of the course equivalencies, it is a lot easier to solve it if you are able to show the material that you have covered to the Waterloo course instructor.

3 WORKING IN GERMANY

As most of you will realize, one year will go by really fast and some might consider extending their stay in Germany. One of the ways of course is to find a coop-term placement!

University of Waterloo does not have a lot of connections with German companies but as you will quickly realize finding a coop job should not be any problem.

3.1 Job Alternatives

Depending on the type of job you are looking for, there are several alternatives at your disposition:

For those who enjoyed their year in Braunschweig and got interested in the research done by any of the Institutes on campus there is a possibility of doing a research type project (Studienarbeit) as the coop term placement.

Every institute will normally post research projects that are open at their institute since German students are required to complete this as one of their graduation requirements. One of the exchange students from Waterloo has chosen to do this as his coop and had no trouble obtaining the credit for it. Even though it's a rewarding and a challenging experience, one should be aware that it is also a non-paid position.

If you are more interested in the jobs in the industry, consider visiting the job fair (Firmenkontaktmesse) that normally takes place toward the end of January. This fair is quite similar to the Waterloo job fair for example. A lot of big famous German companies are often represented here, so this is a very good opportunity to submit resumes or get more information about internship opportunities. Some of the companies that offer electrical engineering placements are: Siemens, VW, EADS, Rhode & Schwarz, Philips etc.

For more information:

<http://www.bonding.de/web/web.nsf>

If none of these companies spark interest or there is a specific company you want to work for, you can always visit that company's website and apply online. Most of the

big companies tend to have internship programs already in place and getting a placement should not be too challenging.

Of course do not forget the resources that you have around you. Talk to the German students that have been on exchange to Waterloo or any German contacts made over the year. These people will be more than willing to help you out in your job search process.

3.2 Applying for the job

One of the most difficult steps in the job application process is writing a resume and a cover letter in German. The German format for the resume is somewhat different from the Canadian one. It is a bit more personal in the sense that oftentimes, the applicants will put their picture on the resume as well as personal information such as the date of birth and nationality which in Canada is considered as basis for discrimination.

Asking for help from a native speaker is the best way to ensure having a well-written resume that fits the expectations of the German employers.

3.3 Dealing with the formalities

Once a coop placement is secured, there will be a couple of things that need to be taken care of.

First, contact the CECS at UW to inform them that you have found a coop placement overseas. A few forms need to be filled out in order to get the coop term credit.

At this point, I recommend getting a letter from Dr. John Westlake stating that this internship is compulsory during the course of studies. In my case, the company I was working for explicitly asked for such a document, but I found that it was very useful to have as it made the visa extension process very simple.

Your visa will most likely expire at the end of the first year. To extend it, simply go to the town hall (Rathaus) few weeks before it expires. Some kind of proof that you are currently doing an internship should be brought.

Remember that in every German city, every person that moves to a new city needs to go and register in the town hall, as well as de-register (abmelden) once she/he is leaving the country. When moving from one town to the other, it is not needed to

de-register from the town you are currently in. One should simply go to the town hall in the new city and they will take care of transferring the file.

3.4 On the job

The idea of working in a foreign country might be a bit scary at first. However one should know that internships in Germany are a bit different from our coop-terms. Germans consider student placements for the most part as a learning experience for the student. This means that although students will be given real engineering work, they are not be expected to be an expert in it. The flip side of the medal is that because this is supposed to be a learning experience for the student, the pay is also much less then what would be expected in Canada. The pay will vary anywhere from 550euros to 1200euros per month depending on the company. On average, a normal monthly pay is around 750euros.

I should mention that most German students do a 6-month internship. When applying for a job, you should mention in the cover letter that you are looking for a 4-month internship unless you are able to stay for the full six months.

What you will gain by doing an internship overseas outweighs by far the low pay. You will gain international work experience and get a feel of how a typical German company functions. This is a set of transferable skills that might be very useful to you later on in your career. I also found that the four extra months allowed me to improve my language skills as I was communicating every day in German with either my co-workers or other coop students. And of course, you get more time to explore bits and pieces of Europe that you haven't had a chance to visit yet during the first 12 months!