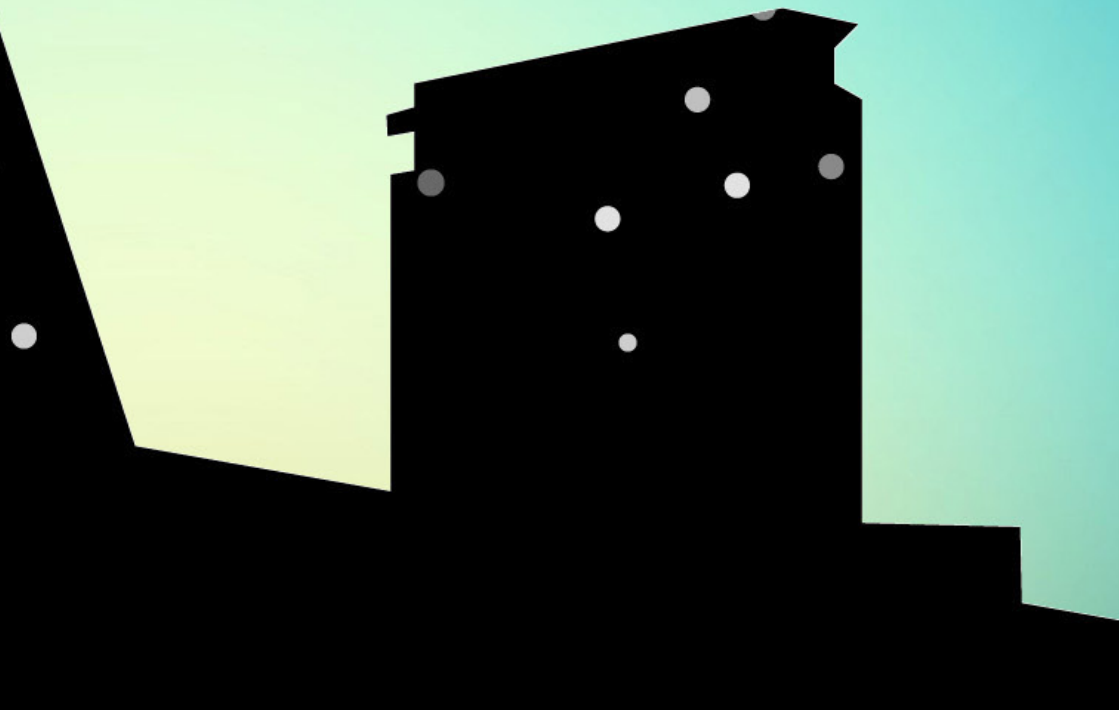
Wiskunde
Informatica
Studievereniging

'Christiaan
Huygens'

Minor brochure 2018-2019



Disclaimer

This brochure is made with care, we strived to make all the information complete and correct. However, imperfections caused by human mistakes can occur, which is why we can not guarantee the correctness and completeness of the data that is shown.

Contact details CH

Opening hours

Monday from 13:00 until 17:00
Tuesday until Friday from 9:00 until 17:00

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Table of Contents

Introduction

The minor is a cohesive collection of courses worth a total of 30 ECTS credits, accounting for six months of your studies. You take your minor in the first semester of your third Bachelor's year. You are entirely free in your choice of minor. It therefore provides an appealing opportunity to look beyond the bounds of your own discipline.

Over the years, we have noticed that the general information about minors was not always in line with the experiences of our students. Therefore we composed a brochure with the experiences of our Applied Mathematics and Computer Science students. In this brochure you can find general information about following a minor and a number of student experiences. This way we hope to give you more insight in the possibilities that the minor offers you.

We want to improve and update this brochure every year. If you have a followed a minor that is not yet included or have a different opinion on a certain minor, contact us at education@ch.tudelft.nl.

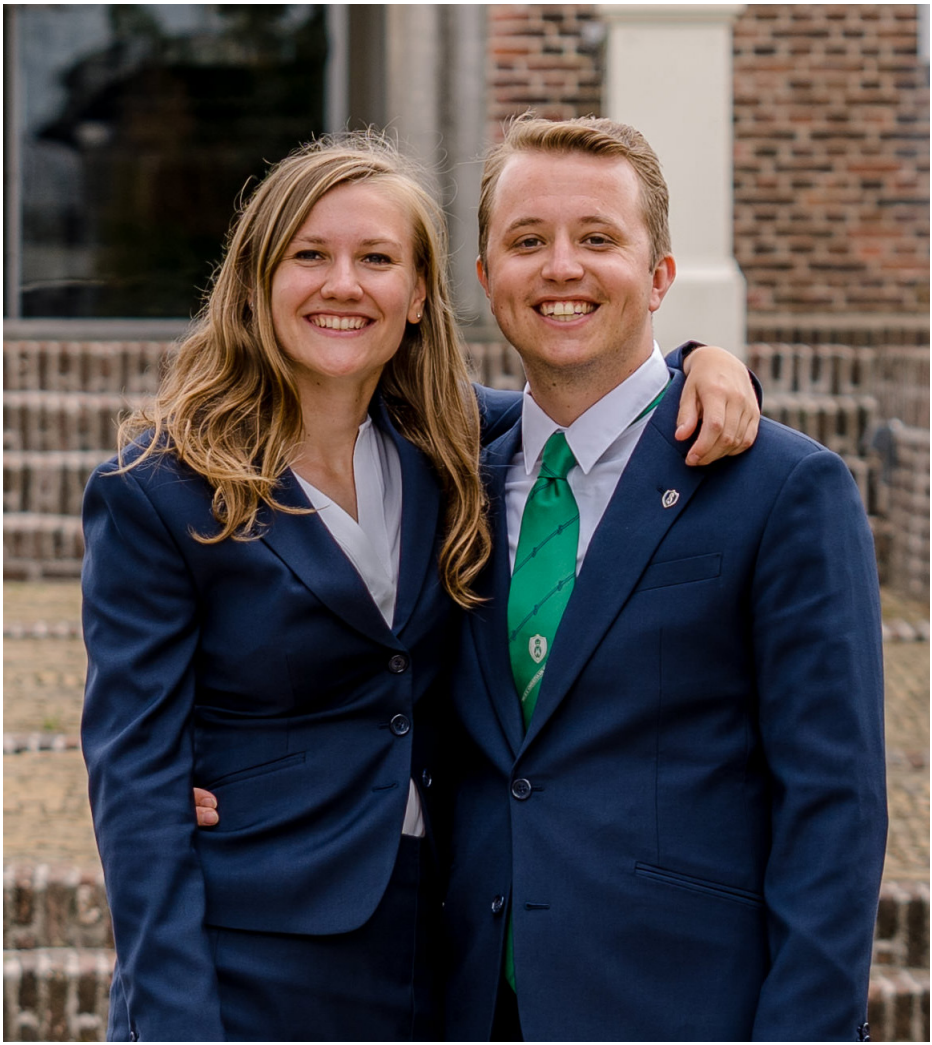
Good luck with choosing your minor!

Kind regards,

Annemieke Brouwer and Jurriaan Den Toonder
Education Affairs
W.I.S.V. 'Christiaan Huygens'

Annemieke Brouwer - Applied Mathematics

Jurriaan Den Toonder - Computer Science



Practical Information

Overview of TU Delft minors

On the right you can find an overview of the minors at TU Delft that are open to Applied Mathematics and Computer Science students. All thematical minors of the TU Delft are taught in English, excluding the minors: Educatie, Ondernemerschap: Med-Tech Based Entrepreneurship, Ondernemerschap: Technology Based Entrepreneurship and Security, Safety and Justice.

Bridging minors

A bridging minor offers students the possibility of admission to a Master's programme other than their general Master's (the Master's degree programme in the same discipline as their Bachelor's degree programme). A bridging program often requires more than 30 EC and is therefore not always possible as your minor. Contact the relevant faculty for advice.

Minor at another university in the Netherlands

If you want to follow a minor at another university, this minor must be accepted by the exam committee of your degree program. Minors at the other universities of technology are usually accepted. Make sure to check beforehand whether you may be admitted to the minor of the relevant university. If so, you must register at that university too.

The TU Delft has a minor cooperation with Leiden and Erasmus. The minors at Erasmus University Rotterdam (EUR) constitute to 15 EC in total. Following two EUR minor is not possible and the options for doing electives there is small, so it is advised to follow electives at TU Delft. Minors at Leiden University are worth 30 EC, but are not clustered in the first semester like in Delft. Information about this is available in the study guide of Leiden University.

Minors TU Delft 2019-2020

Faculty	Minor code	Minor name	EC	Education-period	EEMCS		
					Computer Science	Applied Mathematics	Selection Procedure
3ME	BME-MI-087	Biomedical Engineering	30	Q1/Q2	✔	✔	✔
	WB-MI-168	Robotica	30	Q1/Q2	✔		
	WB-MI-217	Engineering for large-scale energy conversion and storage (ELECS)	30	Q1/Q2	✔	✔	
	MT-MI-105	Zeiljachten	30	Q1/Q2	✔	✔	
BK	BK-MI-203	Archineering Q1	15	Q1	✔	✔	✔
	BK-MI-204	Archineering Q2	15	Q2	✔	✔	✔
	BK-MI-211	Heritage & Design Q1	15	Q1	✔	✔	✔
	BK-MI-212	Heritage & Design Q2	15	Q2	✔	✔	✔
	BK-MI-197	Spatial Computing in Architectural Design	15	Q2	✔	✔	✔
CiTG	CT-MI-220	African Dynamics (LDE minor)	30	Q1/Q2	✔	✔	✔
	CT-MI-147	Bend and Break	30	Q1 /Q2	✔		
	CT-MI-166	Delta Expert: Water for the Future	30	Q1 /Q2	✔	✔	
	CT-MI-199	Environmental Engineering: From Waste to Resource	30	Q1 /Q2	✔	✔	
	TA-MI-192	Geo-resources for the Future: Social, Economic, Environmental and Political Challenges (LDE minor)	30	Q1 /Q2	✔	✔	
	CT-MI-186	Integrated Infrastructure Design (IID)	30	Q1 /Q2	✔	✔	
	CT-MI-174	Projectmanagement from Nano to Mega	30	Q1 /Q2	✔	✔	
	CT-MI-127	Transport, Infrastructure and Logistics	30	Q1 /Q2	✔	✔	
EEMCS	TW-MI-195	Computational Science and Engineering	30	Q1 /Q2	✔	✔	
	ET-MI-201	Electronics for Robotics	30	Q1 /Q2	✔	✔	
	ET-MI-190	Electrical Sustainable Energy Systems	30	Q1 /Q2	✔	✔	
	TW-MI-097	Finance	30	Q1 /Q2	✔	✔	
	TW-MI-187	Mathematics and Finance	30	Q1 /Q2	✔	✔	✔
	TI-MI-200	Computer Science	30	Q1 /Q2		✔	
IO	IO-MI-221	Advanced Prototyping	30	Q1/Q2	✔	✔	✔
	IO-MI-222	Designing Sustainability Transitions	30	Q1/Q2	✔	✔	
	IO-MI-124	Interactive Environments	30	Q1 /Q2	✔	✔	✔
TBM	WM-MI-191	Companies and innovation: economical, ethical, juridical and safety perspectives	30	Q1 /Q2	✔	✔	
	WM-MI-196	Frugal Innovation for Sustainable Global Development (LDE minor)	30	Q1 /Q2	✔	✔	✔
	WM-MI-101	International Entrepreneurship and Development	30	Q1 /Q2	✔	✔	✔
	MOT-MI-153	Ondernemerschap: Med-Tech Based Entrepreneurship	30	Q1 /Q2	✔	✔	✔
	MOT-MI-088	Ondernemerschap: Technology Based Entrepreneurship	30	Q1 /Q2	✔	✔	✔
	WM-MI-180	Responsible Innovation (LDE-minor)	30	Q1 /Q2	✔	✔	
	WM-MI-099	Security, Safety and Justice (LD-minor)	30	Q1 /Q2	✔	✔	
TNW	SEC-MI-177	Communication Design for Innovation	30	Q1 /Q2	✔	✔	
	SEC-MI-049	Educatie	30	Q1 /Q2	✔	✔	✔
	TN-MI-189	Modern Physics	30	Q1 /Q2	✔	✔	
	TN-MI-219	Quantum Science and Quantum Information	30	Q1/Q2	✔	✔	
L&R	LR-MI-167	Airport of the Future	30	Q1/Q2	✔	✔	
	LR-MI-176	Offshore Windenergy	30	Q1 /Q2	✔	✔	

Study Abroad

The minor Study Abroad gives you the opportunity to study at a foreign university. Experience abroad is seen as beneficial to your university education and personal development. The spots at other universities are limited, so you will be selected based on study progress, grades and motivation. It is required that you finished all your first year courses.

Preparing for a minor abroad starts early: six to nine months before your departure. Firstly, you need to decide where you would like to study by selecting three universities. Information about possible universities is available on studyabroad.tudelft.nl. Check if you can create a coherent set of courses worth 30 ECTS and make sure there are no language restrictions for you.

Contact the International Office EEMCS for the next steps in your application process. Be sure to check the deadlines. The internal selection deadline is generally in January. Within a month you will hear if you are selected for one of your choices.

Create your own minor

TU Delft offers plenty of carefully compiled minors. Should you however choose to create your own minor, than you must submit your well-founded application to the Board of Examiners of your own Bachelor's degree programme. This demands a high degree of independence and ample preparation time. Also take into account the requirements that need to be met for your degree programme itself. Personal timetables can be compiled using 'My Timetable' (https://mytimetable.tudelft.nl). The timetables will be finalized by mid-August.

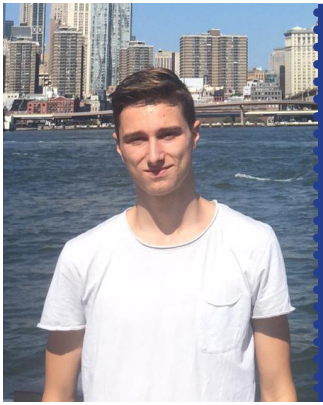
Deadlines and registration

March 10 - April 22	Registration Education Minor
April 10	Minor Event
May 3 - May 31	First registration period
July 1 - July 31	Second registration period

All above data are also mentioned on https://minor.tudelft.nl.

Website

The information in this brochure gives you a short overview especially for AM and CS students. More information about minors is available at minors.tudelft.nl. This is the ideal starting point to explore the possibilities a minor offers or to check more details of a certain minor. Also updated information about registration and deadlines is stated here.



Name: Timo van Asten

Study: Computer Science

Minor: Abroad in America

When: 2017-2018

Hello reader,

I'm Timo, and to start off I would like to say: if you got the chance to do so, go abroad for your minor. It was an experience I will never forget, and I met many people that gave me so much energy, love and friendship. For my minor I went to the University of Maryland; a university close to Washington DC. It was a decision I took somewhat impulsively, but I am so glad I made the decision to go. A friend texted me that the deadline for a minor abroad was 2 days later, and I did not pay attention to this deadline at all. In the short time that I had, I wrote a motivation letter and did some research. The University of Maryland ended up in my top three. Four days later I received an email that I was selected to go, and 7 months later I got onto a plane to the US.

It is amazing how refreshing it is to get away from the daily routine. Everything you see is new. Everyone you meet is new. American college life is so different from ours, which you notice in a few things. The whole campus is like a big town, where students are the only citizens, and this makes it ridiculously easy to make new friends. There is a party around every corner (yes, also the frat party's you see in the movies). You don't cook or do the dishes, but there is one big dining hall where all the students eat and all of this is done for you.

About every two weeks there is an American football match which you can go to free of charge. Everyone dresses up in UMD clothing and students have drinks together from the back of their car, called 'tailgating'. It is one of the most exciting days on campus called 'game day' and it is so cool to experience this yourself. I got to see Washington DC, New York, Chicago and Miami.

… and of course, you also study, but you don't even notice that you are.

Studying abroad was just what I needed to bring back my joy in studying. It has changed me as a person and living in another country for 4 months makes you appreciate things about your own country you didn't even know were special. Just go!

America

Coordinator: Jitske van der Laan

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Faculty: EEMCS

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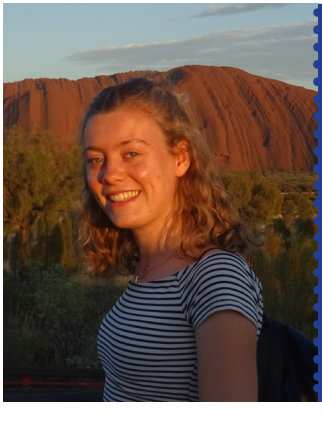

Name: Simone Vis

Study: Applied Mathematics

Minor: Abroad in Australia

When: 2018-2019

Hi, my name is Simone Vis and I am currently 21 years old and a third year bachelor student Applied Mathematics. From July till December 2018, I went on exchange as part of my minor abroad to the University of Sydney in Australia. I always wanted to study abroad and preferably outside Europe. I chose to sign up for universities in English-speaking countries because it would be easier to choose courses. After registration, I was accepted at the first university of my preference, the University of Sydney. Then came the arrangements such as choosing courses, arranging housing and a student visa. I chose to take economic (math) courses because I wanted to broaden my horizons in economics.

The University of Sydney is a great university with 60,000 students from which around 25 percent are internationals, most of whom are Asians or Europeans. This gives you the possibility to get to know new cultures and make friends all over the world. I am still in contact with some friends. The university also offers courses in almost all fields and not specifically for technical studies, which is great if you want to follow courses in different fields.

All courses are fairly easy to follow, which allowed me to do many other things besides my studies. For example, I learned to scuba dive, I became a member

of an outdoor association to enjoy hiking, snorkelling and camping in the nature around Sydney and I undertook many fun activities with other exchange students. I had a great time in Sydney, but one person can adapt more easily than another. What is the best tip to feel at home at the other side of the world? Build up your circle of friends and life there as quickly as possible and enjoy it, because it's over before you realize it.

Moreover, the semester already finishes at the end of November, which gives you the opportunity to travel for 2 months afterwards. At least, this is what I and many of my friends did because there is a real backpacker culture in Australia.

So if you are interested in making friends all over the world, exploring other cultures and studying in a completely new setting, than studying abroad will definitely be something for you!

Australia

Coordinator: Jitske van der Laan

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Faculty: EEMCS

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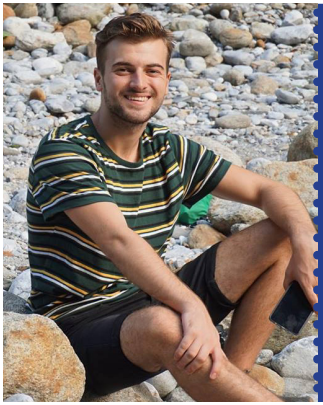

Name: Daniël van Gelder

Study: Computer Science

Minor: Abroad in Singapore

When: 2018-2019

For my minor, I decided to take a leap of faith and go study abroad. During the last semester I spent my time studying at Nanyang Technological University in Singapore (NTU). I had an unbelievably great time and an experience of a lifetime! Not only did I get to meet some awesome people, but also got to travel around Asia and see many great things.

However, studying was of course the most important part of my time there. For my minor I took five courses: three Computer Science courses, an economics course and a Chinese language course. It was a lot of fun studying Chinese and although I only learned the bare basics, the course was really interesting. As for the other courses, they were less interesting as the level wasn't that high and the content not that interesting. The workload was in general lower than in Delft. This gave me a lot of opportunity to travel and do cool stuff in Singapore itself.

Singapore is a really interesting country and is a kind of hub for Southeast Asia, this means that you can do a lot of cultural stuff there. On the other hand, it is a very modern country where you can do lots of shopping and partying. I got to do a lot of travelling around Asia and got to visit amazing countries. The countries I got to visit were: Malaysia, Vietnam, Thailand, Taiwan and

Hong Kong. There are, however, many other countries that I would like to have visited but didn't get the chance to travel to.

I would recommend anyone to study abroad for their minor, it is an amazing experience where you learn a lot. I'm very glad I took the opportunity to go to Singapore and would do it all over again.

Singapore

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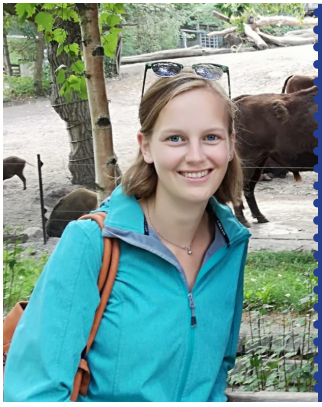
Faculty: EEMCS

https://tinyurl.com/yxohtucy



Name: Eva Slingerland

Study: Applied Mathematics

Minor: Abroad in Sweden

When: 2018-2019

Hi, my name is Eva and I am a third year BSc Applied Mathematics student. For my minor I decided to go abroad, since that has always been something that I wanted to do. I ended up going to Stockholm, which was exactly what I wanted!

So, I spent a semester at the Kungliga Tekniska högskolan in Stockholm. Most of the courses there are 7.5 ECTS, so for my minor I had to choose 4 courses. I ended up taking a Swedish language course, two machine learning courses that were part of the mathematics master there, and a course about the theory and methodology of science. It was really interesting to see how other universities organize their lectures and exams. For example, the exams there are 5 hours, which is crazy! I was completely exhausted after such an exam, but on the other hand, I never ran out of time so I could always finish all the exercises. I also noticed that the courses didn't demand as much work as what I am used to in Delft and that our university is very highly respected. When I told people that I study at TU Delft, they were really impressed and a lot of students I talked to told me they applied there but didn't get in.

Next to the studying, I also joined a choir called Osqstämman and THS MAIN, which is an association for master and international students. With the choir

I got extra practice in my Swedish, since a lot of the songs were Swedish, and some of them we even had to study by heart. We had weekly rehearsals, a few choir weekends and several performances. For one of the performances, we worked together with an orchestra and ballet group, so that was really cool! With THS MAIN, I organized and participated in pub nights, a beer pong tournament, a karaoke evening, a pub crawl and a big Christmas dinner and party. Apart from that, I also made a lot of trips to the neighbouring countries, so I visited Finland, Estonia, Latvia, and Russia.

Doing your minor abroad is really a challenge: you have to arrange a lot of stuff and being on your own in a completely new environment can be hard sometimes, but in my opinion it's definitely worth it!

Sweden

Coordinator: Jitske van der Laan

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Faculty: EEMCS

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Name: Vera Martens

Study: Applied Mathematics

Minor: Bridging programme CS

When: 2018-2019 (full year)

Hey! My name is Vera, I'm 21 years old and I'm a third year Applied Mathematics bachelor student. In September, I started with the bridging programme to Computer Science, which I do as my Free Minor. I came up with this idea by myself and so far it works out really well!
At first, I wanted to do a CS minor, because I like the more Computer Science-ish area of math, and I already had done the CS elective course in my first year, which I also really liked. However, the minors within EWI were all a little bit too mathematical in my opinion. Because I might want to do a CS master, I came up with the idea to already start with the bridging program.

The program contains a total of 45 EC of courses that cover the knowledge that you necessarily need to be able to start a master in Computer Science. Normally, you would do this between your bachelor and the master, because the courses lie throughout the year. However, it was possible for me to do the switch during my bachelor, because I will do my bachelor in 3.5 years, and so I had the time and space to do the CS courses next to my math courses. Moreover, I didn't have to do all the courses. As already mentioned, I chose Algorithm and Data Structures as elective course in my first year, so I didn't have to do that course anymore. Furthermore, 2 other courses would already have been covered in the AM bachelor. So, only 30 EC were left, which fits in

a minor.
If you didn't do ADS in your first year, it is still possible to do the switch. For example, it's allowed to finish your program after starting your master.

At the moment I'm half way the program and I really like it! Compared to math, I like how practical CS is and it feels like a sort of puzzle and challenge. I also like that during programming you get feedback on what works and what not. Because the program contains a lot of different courses, it helps with finding out what I like within CS. Besides, I have the opportunity to do a CS master if I want to. Therefore I'm glad that it was possible to do the bridging program during my minor!

So, if you are an AM student who likes programming and algorithms, and not sure if you want to do a math master, I would recommend this Free Minor to you! If interested, I wrote a more extensive article for the next MaCHazine, in which I explain what the procedures are to make it work.

Bridging programme Computer Science

Coordinator: Jolien Kooijman

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Faculty: EEMCS

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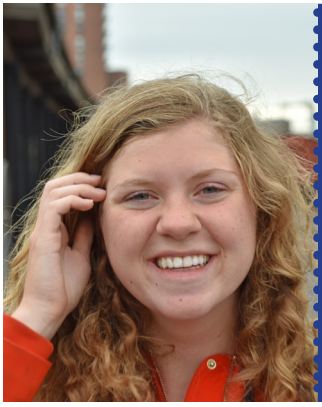

Name: Louise Zwep

Study: Applied Mathematics

Minor: CDI

When: 2018-2019

Communication Design for Innovation is all about turning you into a so called 'all-round engineer'. As an engineer, you should not only be able to think about solutions to difficult problems, but also how to present these solutions to the world. We are communicating all the time, but in our studies there is almost no attention for it. In CDI, you learn how people communicate, why people communicate and how people work together.

The minor proceeds as follows: you get a communication problem from a real company. For instance, I got a project of people working together on creating a Blockchain network. To this end, they started an online work environment, Google Drive a la LinkedIN a la Overleaf. It would be a tool which would fix all their problems, but no one was using it. Now was the question to me and my group: why is no one using the online collaboration tool? This was the main project I was focussing on.

To find a thorough solution to this problem, we got courses which gave us the theoretical background. First quarter we had a course on psychology and the second quarter on marketing for innovation. These courses gave us the insights we then could use in our project.

Next to this, you also get 'masterclasses'. These are 2 or 3 full days on which you focus on the soft skills of communication. You'll learn for example how to using drawings to clarify yourself, how to communication despite cultural differences and how to make yourself credible in a presentation. All super useful skills for the rest of your career!

All in all it was very informative (and fun!) to do something not technical for half a year. You work in groups with people from all different backgrounds and learn a lot about the way they handle a problem. This minor broadens your way of working and thinking and gives a lot of new insights. So if you want to do something completely different then AM or CS, I would highly recommend CDI!

CDI

Coordinator: Éva Kalmár

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Faculty: Applied Sciences

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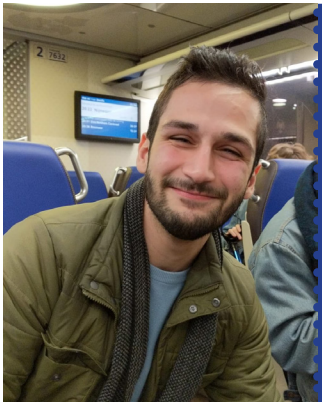

Name: Arian Joyandeh

Study: Applied Mathematics

Minor: Computer Science

When: 2018-2019

After having seen Computer Science students do the coolest of things in the first two years of my bachelor, I wanted to be able to do similar things. That is why I choose the minor Computer Science.

The three most important things I have learnt from this minor are: learning about machine learning and the mathematics behind it; project management by using agile methodologies and of course programming for all kinds of purposes. In the following three paragraphs I will explain a bit on these points.

First of all, machine learning. You probably have heard this term being used as a buzzword, but I found it really cool actually. In the course 'Computational Intelligence' you learn all about machine learning and the ideas behind it. One of the projects we had to do for this course, was training 'ants' (not real ants, but on the computer) to solve a maze on the computer. In this course I learned how my mathematical background gives me a great advantage in understanding such processes.

Secondly, I learned a lot about project management. In the 'Software Engineering Methods' course, you learn about agile methodologies and you put these methodologies to use immediately during the project that is also part of

the course.

Lastly, programming. It's no mystery that in a Computer Science minor you're going to program a lot, but what surprised me is how small things I want to do on my computer are going way easier because of my newly acquired skills.

The most useful information I can give you, is the fact that as an Applied Mathematics student, you probably have finished the course 'Introduction to Programming'. A very similar course to this is part of the core of the minor, which is why you will need to find a replacement. I followed the first year Computer Science course 'Object-Oriented Programming' and it was very interesting. Perhaps you have also finished the Algorithms and Datastructures elective during your bachelor, a similar course to this one is also part of the core of the minor, then you will also have to find a replacement for this course. I highly recommend following 'Algorithm Design', which is a course for the second year Computer Science students and a follow-up on the Algorithms and Datastructures course.

Computer Science

Coordinator: Maurício Aniche

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Faculty: EEMCS

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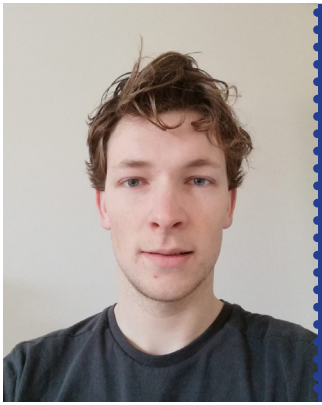

Name: Douwe Hoonhout

Study: Computer Science

Minor: CSE

When: 2018-2019

Hi I am Douwe Hoonhout. I am a fourth year bachelor student of Computer Science. This year I did the minor Computational Science. Before Computer Science I was already interested in Mathematics as well. That is why I was interested into doing a minor related to Mathematics. Also there were some Programming courses which to me seemed a nice way to broaden my programming skills. These programming courses mainly focussed on solving heavy computations. One course is fully focussed on parallelization since doing computations in parallel is a great way to speed up your heavy computation. Another programming course was mainly focussed on errors that will occur when doing computations. Some numbers have some many decimals that you can not normally store it into a computer. This can lead to big errors over time compared to the actual result.

The two numerical method courses were very hard for me. If you are from Computer Science and you want to do this minor, I would highly suggest you do some numerical methods before you start. For me it was the first time I was exposed to numerical methods and I would say that most people should have some pre knowledge.

Last but not least is the project which combines all knowledge to actually make

your own numerical implementation. The nice thing about the project is that they will mix computer scientists with mathematicians (and other studies). Which results in students that can really help each other since they have different backgrounds.

CSE

Coordinator: Berna Torun

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Faculty: EEMCS

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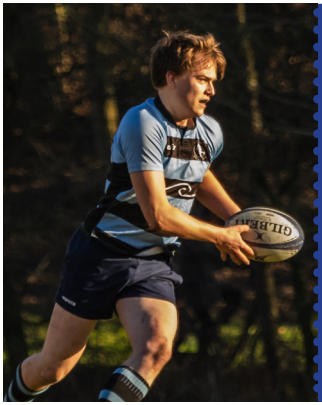

Name: Jonathan Katzy

Study: Computer Science

Minor: CSE

When: 2017-2018

Hey, my name is Jonathan Katzy and I am a first year master student of Computer Science at the TU-Delft. During my Bachelor, that I also got at the TU-Delft I did the minor Computational Science and Engineering.

The CSE minor is a minor that can help you widen your view in Computer Science by going more into depth about parallel programming, as well as going more in depth into areas such as compilers which are skipped over in the Bachelor. Furthermore this minor will introduce you into some basic mathematics, primarily differential equations, where there are 2 courses about numerical methods, and stochastic differential equations. My reasoning for choosing this minor was that I enjoyed Computer Science but also wanted to do some more mathematics, which worked out quite well for me in this minor. For both mathematics students and Computer Science students I would recommend this minor, primarily because it lets you broaden your knowledge whilst remaining marginally in your own discipline, and of course the study load is not too high if you work with people from other disciplines.

The minor overall is not too challenging, for people from Computer Science who have only followed the calculus course it may take a bit to get up to speed with the mathematics being discussed in the mathematics courses, however I

found that there are plenty of non Computer Science students willing to help you out. When it comes to the Computer Science courses, they are a breeze. The main advantage to following them is that you get more insight in things like handling catastrophic cancellation, and working with numbers that are larger than standard floats. Also, you get an introduction to C++ and how to work with memory allocation and compilers. This is what I found the most interesting about the Computer Science classes as it is often ignored in the rest of the bachelor. For the Computer Science classes you will find though that you may want to help out the people from other disciplines as they will not have had as much experience programming and will often struggle with some aspects.

The overall workload of the minor was very doable. You should definitely be prepared to put in some extra time for the mathematics courses, but this is more than offset by the relatively little effort you need to do to pass any of the courses that require programming. One thing to be aware of though that was very different for me is that, if they are using the same course structure, you will need to do an oral exam for the stochastic differential equations course, which may seem daunting but was actually nicer to do than a written exam.

CSE

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Faculty: EEMCS

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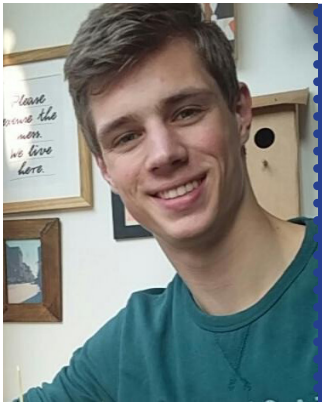

Name: Abel Frank

Study: Applied Mathematics

Minor: Education

When: 2018-2019

Do you enjoy working with teenagers, making a difference for others and do you want something completely different than just following classes? Then you should really consider the minor Education. In just slightly less than 5 months you will learn how to teach mathematics at a secondary school. You will learn to understand what it is to be a teacher and experience education from another point of view. And as bonus you receive a teaching qualification, which allows you to teach children aged 12-15 at a secondary school.

Hello, I am Abel Frank (21) and at the moment of writing I just completed my minor Education and I am almost ready to start my bachelor's final project Applied Mathematics. The minor consists of three parts. The first six weeks are for orientations. In this period, I observed other teachers and carried out assignments. It is important to get to know the children as you are going to teach them within time.

The second period is the practical part, because you are going to teach several classes now. As you can expect this is the most challenging period. Do not underestimate it, as it will take a lot of energy and time. As an AM student I had an advantage, because I did not have to delve into the math material and practice some topics again.

Once a week there are classes in Delft where you will follow some educational courses. These courses covered the theoretical part of education, which I did really enjoy as I preferred to teach. The last part is after Christmas. This is the moment to complete you last assignments and hand in your portfolio.

I think that the education minor is fairly practical, which is awesome since you mostly follow theoretical courses at the university. I received many positive reactions from the children I taught and even from my colleagues. That made me realise that being a teacher is a very rewarding profession. I even got a temporary job at my internship school. After the minor I noticed that my presentation skills improved immensely, and I can give a presentation without any nerves.

Therefore, I recommend the educational minor to everyone who likes working and teaching children and is looking for a practical minor.

Education

Coordinator: Suzanne Karssen-Minekus

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Faculty: Applied Sciences

https://tinyurl.com/y5vt3zwr

Name: Jip Rietveld

Study: Computer Science

Minor: Education

When: 2018-2019

Last year when I had to choose my minor, the obvious choice was education. During secondary school and at university I was always interested in teaching as a profession. Trying it out in a such a low-key manner as a minor is perfect. Half a year of doing something totally different than Computer Science.

Three days of the week you will be at a secondary school on an internship. In the beginning, you will be doing a lot of observing, you are observing lessons and making notes on how you want to start teaching your own future lessons. Besides that in the first quarter you have a lot of subjects on preparing your lessons and about how you really teach kids something. In the second half of the minor you are only following lectures in Delft one day in the week. The rest of the days are spent at your internship where you are expected to give nearly 60 hours worth of lessons.

This is hard work. Juggling the assignments given by the TU Delft as well as the tasks given by your mentor at the internship is tough. Long days of preparing your lessons, printing out work sheets and marking tests are all part of the job. Do not pick this minor if you are not ready to put in the extra mile. You cannot slack off on the children you will be teaching and the TU Delft does not expect you to slack off on them.

But teaching children is so satisfying. Working with the kids and seeing their laughs, or seeing their eyes twinkle when they finally understand what you´re teaching them is great fun. You will have an experience with this minor you will not be able to get somewhere else. Besides that, you will have a real certification to teach the lower ages in secondary school as soon as you are finished with your bachelor.

All in all, a minor that is very different to Computer Science. A minor that is a lot of hard work. But it is a very unique and special minor in the stories and experiences you will receive from it.

Education

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Name: Joost Gobbels

Study: Applied Mathematics

Minor: Finance

When: 2018-2019

My name is Joost Gobbels and currently i'm in my third year of Applied Mathematics and last year I took the Finance minor. After finishing my first 2 years I had the idea that I had quite a lot of mathematical knowledge, but that I had much less experience applying this knowledge, therefore I choose to do the minor Finance.

The minor begins with a lot of general information because you need to get used to financial terms. After this all subjects start to go more in-depth. What I liked most about the minor was that it covered a large variety of topics, for example, in Monte Carlo and Time Series, you are modelling different options and stocks. In Current Issues in Mathematical Finance, Principles of Asset Trading and Risk Management you are focusing on daily application of different models and regulations and in the courses Option Valuation and Introduction to Mathematical Finance you go more in-depth about the theory behind all the models.

As a mathematician, the minor shouldn't be very hard for you, but you shouldn't underestimate it. The minor does have quite a lot of mandatory homework exercises, which forces you to keep up with most of the subjects. And this is really necessary, because at the end of Q2 you have 5 exams as most subjects

are semester subjects.

I would definitely advice the minor to all students who want to see applications of their mathematical skills in the field of finance, especially students who liked courses in statistics and probability theory who also want to see some computational examples of their gained knowledge.

Finance

Coordinator: Ludolf Meester

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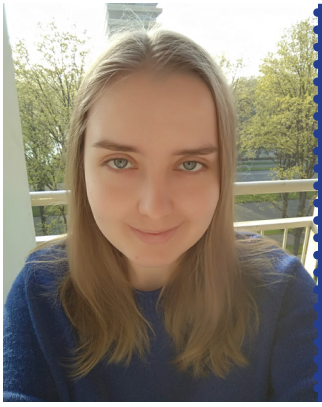
Faculty: EEMCS

https://tinyurl.com/yaqftsjo



Name: Zoë van Steijn

Study: Computer Science

Minor: Finance

When: 2017-2018

Hi there!

My name is Zoë and I'm currently in my first year of the master Computer Science. Last year, I decided to do the minor Finance at the faculty of EEMCS. Even though I study Computer Science I have always had an interest in mathematics. Therefore, I thought it would be nice to do a minor in this direction. After browsing through all available minors I found out about the minor Finance. This seemed to be a good fit, since finance was also an interest of mine. Back then I invested some money in the cryptocurrency market (and failed miserably) and thought it would be interesting to learn some more about stocks and other financial products.

The minor turned out to be very interesting. Many teachers had a background in finance and knew a lot about the subjects they were teaching. The theoretical part of the lectures were often linked to real-life examples. Therefore, you really get the feeling that the material you are learning is actually useful to know.

Since it is a minor from the Mathematics department you can of course expect a lot of mathematics. At the start of the minor you are already expected to be

a bit familiar with probability theory and statistics. On day 1 you get a small exam on this topic. Furthermore, for some of the courses you have to program in Matlab and R, however I think the minor is also doable if you have no experience with this. Many courses have weekly assignments which you have to hand in. These are all individual, the minor does not have any group projects.

All in all, I am really glad I chose this minor. The courses were very well-organized and the study material was interesting. I really recommend this minor to anyone who has an interest in mathematics as well as the financial world.

Finance

Coordinator: Ludolf Meester

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Faculty: EEMCS

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Name: Ilona Post

Study: Applied Mathematics

Minor: Frugal Innovation

When: 2018-2019

Are you interested in working with a multicultural and –disciplinary group of people? Do you want to learn about dealing with unexpected issues? Do you want to broaden your view and develop your social skills and critical view? Then this minor might be for you!

I am Ilona Post, a student in Applied Mathematics and I was part of the very first cohort (2018-2019) of the LDE minor Frugal Innovation. This minor is organised by Leiden University, TU Delft and Erasmus University Rotterdam.

The first 10 weeks you will learn about Frugal Innovation; what it is, what we think it should be, how we can contribute to the UN Sustainable Development Goals and what it has to do with technology, entrepreneurship and development. The latter are also the 3 parts to which the 10 weeks are dedicated; Technology in Delft, Entrepreneurship in Rotterdam, Development in Leiden. The courses are very interactive. You are challenged to take part in discussions and workshops together with a multidisciplinary group of people. Working with such a variety of people demands you to broaden your view and be more critical than ever. The classes are exiting. Attendance is compulsory and examination is done by essays and projects.

During the first 10 weeks you will be busy preparing the internship for the last 10 weeks. During this internship you will take on a frugal project in a developing country with 1 or 2 other students. There will be a variety of projects available from which you can choose. Together with Filip, I went to Uganda for 2,5 months. TU Delft and MUST University (Mbarara) are working together on a sustainable inexpensive MRI machine. We worked on improving the technical development at the university there, we set up a business model for future business, we met with medical companies, visited different hospitals, talked to the ministry and acquired a lot of information from governmental organisations.

The thing you learn most by living and working in a developing country is that nothing goes as planned, but still you deal with it and manage to get something good out of every part of the experience!
If you are interested, still in doubt, curious about experiences or want to know about my approach for the application, you can reach me by email (ilonap@ch.tudelft.nl) or read my small blog on Polarsteps (polarsteps.com/IlonaPost).

Frugal Innovation

Coordinator: André Leliveld

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University: Leiden, Delft & Erasmus

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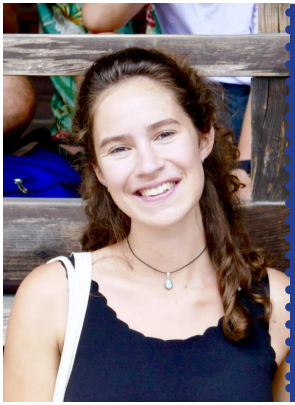

Name: Josephine Keim

Study: Applied Mathematics

Minor: Heritage and Design

When: 2018-2019

"What am I looking for in a minor?", *"What am I missing in my bachelor Applied Mathematics?"*, for me these questions where the key factors to choose a minor. I wanted to do something more creative! That's why Heritage and Design was the perfect combination.

In the minor Heritage and Design you have a combination of art, architecture and design. You get a brief history of Art and Architecture from the year 1300 to present. You get lectures about how to preserve buildings and how to reuse them; heritage. Last there are three design projects, where you get a good taste of the designing part of Architecture. All the projects are pretty diverse; Annualizing a city, designing a park, and redesigning a building. In the last project the most important part was how can you give a building a new purpose, a new use. How can you use the space that already exist, keep the historical parts of the building and give something that the neighbourhood needs. It's a lot more than just the designing part.

For me the best part of the minor was that there would be an excursion every two weeks. We would go to a city in the Netherlands (or even Belgium) and try to recognise the historical creation of the city, the historical buildings and go to an art museum. Because the minor group was so small, we had a

lot of fun on these excursions. Especially, the two days excursion to Gendt and Liege felt like a small holiday. Further, I learned how to use Photoshop and Indesign or how to draw a ground map of a building. It is interesting to work with multidisciplinary group on a project and see how each person has different inputs. Last tip, if you are scared that you have not enough designing background: don't worry they take into account that you don't study architecture.

Heritage and Design

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Faculty: Architecture

https://tinyurl.com/y2acfohy

Name: Marjolein Bouwmeester

Study: Applied Mathematics

Minor: Project Management

When: 2017-2018

While I'm studying in Delft for some time now, I'm still happy with the choice I've made when I was 17 years old: let's study Applied Mathematics! In most parts the study has met my expectations, but I bumped into the fact that I really like working with people, being part of a team and discuss what will be the best approach for a challenge you run into. In the study Applied Mathematics that's not a big part of the programme, so I decided to go into that during my minor. That's why I choose the minor Project Management, from Nano to Mega.

The minor was all about people. I think the sentence 'People are key' has been used at least twice in every course. A result of having that as a main focus is that there is no black and white and right versus wrong, like you have in Math and I think in Computer Science too. There can be multiple ways to be right, as long as you explain it in a good way. I actually loved that. Results were discussable and there was a lot of focus on learning from each other instead of learning from the theory in a book. The side-effect of this is that some of the content could be pretty vague. So when thinking about this minor, take that into account.

The minor consists of 5 courses. In the first ten weeks there was Project Management Basics, which was a lecture based course which is supposed to teach you all basic concepts of Project Management. Also Legal and Finance

was in the first weeks: five weeks of legal (which I found extremely interesting) and five weeks finance (where you could use your mathematics skills a little). Also the project started, which endured the whole minor. The project was meant to apply the knowledge you gained in the courses on a simulation project (of your own choice) which you should manage with your group. The second ten weeks were, like the project which went on, all group based. In programme management there were lectures about how to combine projects and there was a big assignment in which you had to interview a programme manager. The last course was for me the most interesting one, but also the most vague one though. The assignments you had to hand in each week were not that clear, but the professor of this course had invited two project managers each week to be interviewed by us. From project managers of NS to the guys who led the building of the Noordzuidlijn, we've met a lot of people.

About meeting people, don't worry about the group work. When starting the minor, I knew none of my fellow students, but I've met some cool people here quickly, because the whole first week of the minor is all about general introduction and getting to know each other.

Project Management

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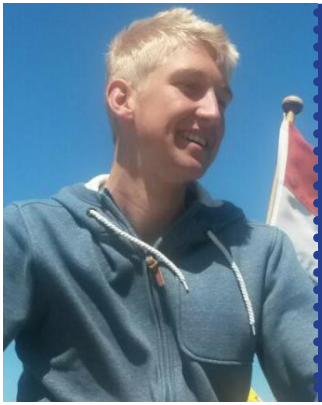
Faculty: Civil engineering

https://tinyurl.com/yxtzqfm3



Name: Tim Rietveld

Study: Computer Science

Minor: Robotics

When: 2017-2018

Hi everyone! My name is Tim Rietveld and I'm currently a first-year Computer Science master student. Last year I've done the Robotics Minor from the 3mE faculty. The main reason why I was interested in this minor is because I really liked the hands-on experience this minor gives you; you start building a robot from scratch with an interdisciplinary team. Besides this, I found the fact that these robots are developed for actual clients very compelling.

During the first quarter of the minor, all students follow courses from the other faculties (Statics and Prototyping for Design in my case) but in my experience this does not require much of your time. Most of the time in this quarter is spent on creating and iterating over the design of your robot. Once the second quarter begins, this design will be the main guideline for developing the robot. During this quarter no other courses are given, so you can focus fully on your robot. Together with my group (2 CS, 1 EE, 2WB and 1 ID student) we started developing Fizzy, an autonomous robot ball for children to play with while being hospitalized, whereas other groups started on robots for other use-cases, such as a bartender robot, a rose-picking robot and an autonomous boat.

Timing and coordination between the group members is crucial during this minor, as the people working on the hard- and software of the robot often

need a prototype from the manufacturing team to perform tests with, and the team manufacturing the robot needs the outcome of these tests to be able to improve the current design.

The minor itself is a lot of work, especially once the development phase of the robot has begun. As there needs to be a working final prototype at the end of the minor, setbacks because of hardware failures and defects can lead to some stressful moments. Be prepared for these failures, as in our case they were way more common than we'd thought up front. Working with an interdisciplinary team helps you approach problems from different stances and find solutions for these kinds of moments.

All in all I would definitely recommend this minor to anyone who is willing to put a lot of hours into a minor and enjoys being part of an interdisciplinary team. Although the minor can sometimes be hectic, you will gain a lot of insights about the total design process of a robot and it is very rewarding to see an actual working product at the end of it.

Robotics

Coordinator: Martin Klomp

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Faculty: 3ME

https://tinyurl.com/y2pxxo3r

Name: Laetitia Molkenboer

Study: Computer Science

Minor: Safety Security & Justice

When: 2018-2019

The minor Safety, Security, and Justice focusses, like the name says, mostly on how do we keep the world safe and secure. However, there are more sides to safety and security than one might think. Because of the combination with the university of Leiden, you learn not only about the more technical side of safety and security, but also the ethics and justice issues surrounding safety and security. Where the TU Delft teaches you about models one can use to approach a safety or security problem, Leiden makes you think about topics such as when are security measures invading privacy or how can one research a crisis.

The minor is split, as mentioned before, between two universities. The courses are as follows: in the first quarter you have the classes Researching Crisis, Security Management and Law and Security taught by Leiden University and Security and Technology taught by the TU Delft. The course Researching Crisis and Security management works towards a final paper the students will have to write, which will be a research proposal. The course Law and Security will also end with a paper in which students have to use the topics that were discussed during the course. The course Security and Technology will have a final exam covering everything discussed during the course. The second quarter consists of Terrorism and Counterterrorism taught by Leiden University and Security and Technology and Security Integration Project taught by the TU

Delft. The course Terrorism and Counterterrorism tries to show that not all assumptions that we have about terrorism are true or only partly true, while also covering show history. Students in this class will have to write a midterm paper and make a final exam. The course Security and Technology discusses the ethical and security implications of new emerging technologies and with a group paper you discuss an upcoming technology. Finally, the course Security Integration Project focuesses on how a security or safety incident in a multi-actor environment can be explained.

This cooperation of universities means you will sit in class with student from a wide range of studies. The professors try to use that unique opportunity to make students aware of different sides to the same story. Where TU Delft students might approach a problem in one way, students from Leiden university or the Erasmus university might approach the same problem in a different way.

Safety, Security and Justice

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University: Leiden & Delft

https://tinyurl.com/y9cb99bq

Name: Lot van Leeuwen

Study: Applied Mathematics

Minor: Sailing Yachts

When: 2018-2019

My name is Lot van Leeuwen, Applied Mathematics student and in the first semester of this academic year I attended the minor 'Zeiljachten' at the faculty 3ME. This minor is completely different than studying mathematics, actually there is barely any math in it. I chose this minor because I've been sailing since I was little and I wanted to know a little bit more about all the physics applied on sailboats. Beside that you get to build your own boat and sail with it, who doesn't like that? In the first week of the minor the course "Inleiding Maritieme Techniek" is taught. This is a recap from the physics we had in high school applied on a yacht. After a week full of lectures given by Jasper den Ouden, you have to pass a test. After you pass that test the minor can actually start. First you form a group of four students. With this group you'll start the project of the first quarter. In this project you create a boat in the 3D program 'Rhinoceros' that has to match certain requirements and of course stay afloat, you don't want any Titanic scenarios. In the second quarter, you're going to work on the large minor project: The 'modelzeilboten race' and two lab assignments. In between the work there will be excursions and guest speakers. The cool thing about this project is that you actually get to build a miniature version of a boat. You have to calculate everything, then lasercut all the parts, put everything together, make the sails and install the electronics. After 9 weeks of hard work there is a race at Marin (Maritiem Research Instituut

Nederland). The race will take the whole day and it's a lot of fun!

For me, this minor was really cool because I learned a lot of skills that are not taught in the Applied Mathematics bachelor such as modelling in Rhinoceros and actually building something in IWS (Inloop Werkplaats Studenten) in 3ME. This minor also forces you to team up with 4 fellow students (not math students) and work closely and intensely with them. Sometimes this is hard and frustrating but also a good thing to experience once in your bachelor.

Sailing Yachts

Coordinator: Hans Hopman

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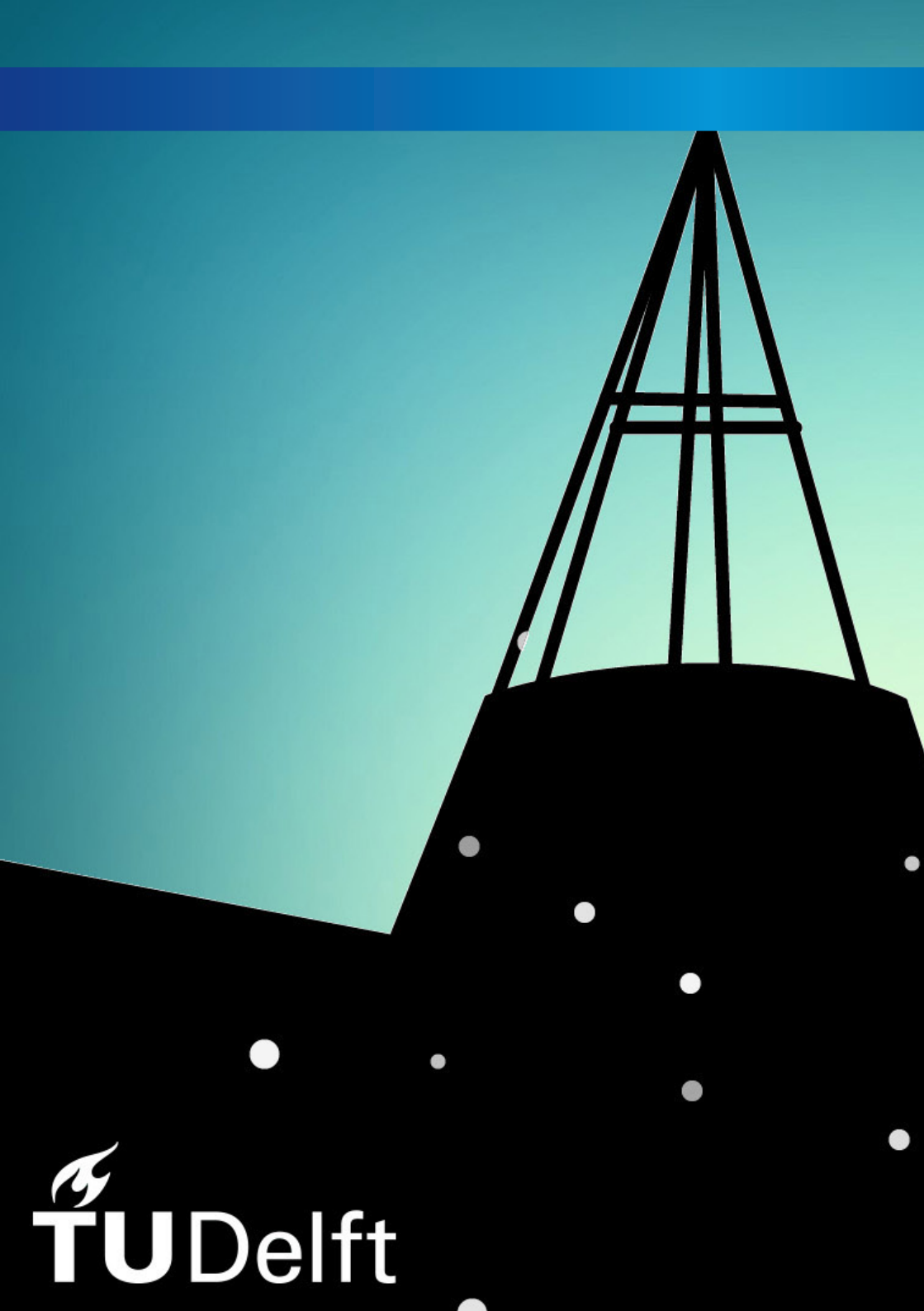
Faculty: 3ME

https://tinyurl.com/y4um7bat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