Wiskunde
Informatica
Studievereniging

'Christiaan Huygens'

Minor brochure 2017-2018

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 de correctness and completeness of the data that is shown.

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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 different opinion on a certain minor, contact us at education@ch.tudelft.nl.

Good luck with choosing your minor!

Kind regards,

Marc Corstanje and Francis Behnen
Commissioners of Education
W.I.S.V. 'Christiaan Huygens'

Marc Corstanje - Applied Mathematics

Francis Behnen - 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.

Minor	Faculty	For AM	For CS?	Selection
Advanced Prototyping	IDE	✓	✓	
Bend and Break	CEG		✓	
Biomedical Engineering	3mE	✓	✓	✓
Communication Design for Innovation	AS	✓	✓	
Computational Science and engineering	EEMCS	✓	✓	
The Delta Expert: water for the future	CEG	✓	✓	
Companies and innovation	TPM	✓	✓	
Educatie	AS	✓	✓	
Electrical Sustainable Energy Systems (ESES)	EEMCS	✓	✓	
Electronics for Robotics	EEMCS	✓	✓	
Finance	EEMCS	✓	✓	
Geo-resources for the Future	CEG	✓	✓	
Heritage and Design	BK	✓	✓	
Integrated Infrastructure Design	CEG	✓	✓	
Interactive Environments	IDE	✓	✓	
International Entrepeneurship and Development	TPM	✓	✓	✓
Mathematics and Finance	EEMCS	✓	✓	
Modern Physics	AS	✓	✓	
Offshore Wind Energy	AE	✓	✓	
Ondernemersschap: Med-Tech Based Entrepeneurship	TPM	✓	✓	
Ondernemersschap: Technology Based Entrepeneurship	TPM	✓	✓	✓
Projectmanagement from Nano te Mega	CEG	✓	✓	
Responsible Innovation	TPM	✓	✓	
Robotica	3mE		✓	✓
Security, Safety and Justics	TPM	✓	✓	
Software Development and Data Analytics	EEMCS	✓		
Spaceflight	AE	✓	✓	
Sports Innovation	IDE	✓	✓	
Transport, Infrastructure and Logistics	CEG	✓	✓	
Zeiljachten	3mE	✓	✓	

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 in BlackBoard in the tab My Student Info, under 'My Timetable'. 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 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: Jacqueline Zijdenbos

Study: Applied Mathematics

Minor: Abroad in Australia

When: 2015-2016

Hi! My name is Jacqueline Zijdenbos, and I am a 20 year old, third year Bachelor of Applied Mathematics student at the Delft University of Technology. From July till December 2015 I did a Minor Mathematics abroad at the University of Melbourne in Melbourne, Australia.

At first, I wasn't sure what I wanted to do with my minor, but going to Australia has always been a dream. I chose the country, got accepted into Melbourne, and later figured out which subjects I would take. It is also possible (and probably easier) to decide in which direction you want to do your minor; Doing mathematics, computer science or something completely different? And choose a good university to go to afterwards.

I did another semester of mathematics. Mathematics would be a course I feel confident in, even in another language. It gave me an opportunity to see other sides of maths. Most of the subjects I took are not taught in Delft, so they would broaden my knowledge. All were approved by the exam committee, so they were of a sufficiently good level.

The University of Melbourne is an amazing university that is pretty similar to the TU Delft. There are a lot of different courses, cultures and lovely people. Even with the high standards in Australia, as a TU Delft student you can follow all the courses quite well. And if you ever have any problems, friendly Aussies will help you out. Balancing studies, social life and living in another country by yourself can be challenging sometimes, but if you're determined to make the best of it, you will.

Exploring the world down under has been an amazing experience. So if you are interested in meeting new people, exploring other cultures and learning something about your (or another) field in a completely new setting, than studying abroad will definitely be something for you!

Minor Abroad

Coordinator: Jitske van der Laan

Mail: exchange-eemcs@tudelft.nl

Faculty: EEMCS

Name: Leon Overweel

Study: Computer Science

Minor: Abroad in Singapore

When: 2017-2018

Hey, I'm Leon and I'm a third-year BSc Computer Science and Engineering Student. I was born in the Netherlands, but I've lived in a bunch of places: during middle school (Dutch elementary school grade 8 to high school year 2) I lived in Dresden, Germany, and during high school (Dutch high school years 3 to 6) I lived in Rye, New York, USA. So after two years at TU Delft here in the Netherlands, I felt the pull to explore another country again. That's why I decided to do my minor abroad at the National University of Singapore (NUS).

Studying in Singapore is very different from studying at TU Delft. Instead of the two ten-week quarters, I had one fifteen-week semester and most classes only had a single two-hour lecture each week. Even though I was taking five classes (required by the TU—some exchange students from the US only had to take three!), the workload was lower than it is at the TU, and there was a bigger emphasis on self-study than on assignments. I took computer science classes in Machine Learning, Computer Security, Optimization Algorithms, and Natural Language Processing, as well as a philosophy class called Language and Thought.

This lower workload leaves lots of time for lots of other things, though. Living in UTown (in a really nice apartment with three fellow exchange student roommates—and a free weekly cleaning service), I had access to a free gym and infinity pool right on the central green, just a few minutes' walk from the apartment, as well as about thirty options for food (you don't really cook yourself). I was also able to travel to Malaysia (during the food festival weekend!), India, Vietnam, and Japan. Generally, getting around and buying food in these countries is much cheaper than it is in western Europe, so if you go, take advantage of that!

I recommend going abroad for your minor to anyone who is independent (you have to organize a lot of things yourself, especially at NUS—getting your courses set up is a mess) and who wants to explore a completely different part of the world! It's also a great opportunity to make friends—I'm still in touch with my roommates from California, Canada, and Germany.

Minor Abroad

Coordinator: Jitske van der Laan

Mail: exchange-eemcs@tudelft.nl

Faculty: EEMCS

Name: Kevin Visser

Study: Applied Mathematics

Minor: Biomedical Engineering

When: 2015-2016

Well, hello there. My name is Kevin and I am currently a 23 years old Master student Applied Mathematics. A few years ago I decided to do the Minor Biomedical Engineering, a Minor mostly given by Material Engineering and Physics professors. I decided to do so, because I wanted to do a Minor which had practically nothing to do with Mathematics and to do something slightly out of my comfort zone. Important to note is that I had already followed a course at Electrical Engineering about Electricity and Magnetism which helped at some points.

During this Minor you will follow courses about several areas in Biomedical Engineering. You will for example a course about how machines like an MRI or a CT-scan work. You will learn the physics and mathematics, e.g. Fourier Transformations, behind this. Other courses teach you about the materials uses during hip replacement surgeries, or about how muscles, tendons and joints work. During the Minor you will have the opportunity to be present at an autopsy, or to have a guided tour at the AMC in Amsterdam to see the earlier mentioned machines in real life.

In the second quarter you will do a large final project worth 12 EC in which you put the knowledge learned in the first quarter to use. In the year I was doing the Minor, some people developed a special kind of bed for infants called CloudCuddle and are currently starting a business. I did a project commissioned by the Dutch Forensic Institute. Unfortunately I am not allowed to say much more due to a Non-Disclosure Agreement.

I would say that every Mathematics or Computer Science student should be able to follow the Minor. If you are interested in doing a Minor in the medicine area combined with some technical aspects, this Minor is for you. If you are looking for a doable, mostly stress-free Minor with enough time left for a social life, this Minor is for you.

P.S. It is awesome to say you've developed a machine that is currently used at several Dutch Forensics Institutes.

BE

Coordinator: Dick Plettenburg

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Faculty: 3mE

Name: Chris Mostert

Study: Computer Science

Minor: CDI

When: 2017-2018

My name is Chris Mostert, I am a third-year computer science student and 21 years old. Last year I chose the Communication Design for Innovation minor to have a breath of fresh air. Because the Computer Science Bachelor focused heavily on more abstract matters, I thought it would be nice to do a minor with a more down-to-earth subject matter. I also thought that it would be nice to expand my horizon a bit and thought that the skills I would learn in the minor might really benefit me later in the Computer Science world.

The workload of the minor is very manageable, you have two 'traditional' courses, with lectures and an exam. Next to these courses you have one large project in which you design a communication strategy for a case commissioner from a real company. In addition, you have several masterclasses which aim to teach you a certain skill, like business negotiation or visual thinking. The minor teaches you a broad set of skills which I think will certainly be beneficial in my future career.

For Computer Science and Applied Mathematics students this minor will feel very different, and that is exactly why I chose to do it. You will be reading a lot of literature in psychology, marketing and design. You will be actively working

together with your multi-disciplinary team and your case commissioner to iterate over and design a set of tools to help them solve their communication problems in their organization.

If you choose this minor, you need to feel comfortable with working in teams on a large project and be open to a more 'alpha' side of science. At times as a Computer Science student the subject matter might feel very vague, but it can really give perspective on a different kind of science and improve your communication skills at the same time.

CDI

Coordinator: dr. Éva Kalmár

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Faculty: Applied Sciences

Name: Angelica Babel

Study: Applied Mathematics

Minor: CDI

When: 2016-2017

Hello! I'm Angelica, I'm a 21-year-old. This year I'm determined to finish my bachelor Applied Mathematics. Next year I'm planning on starting my double degree master, Applied Mathematics and Science Communication. The reason why I want to do a master in Science Communication has everything to do with my minor, Communication Design for Innovation.

In my search for a minor, I was looking for something very different than mathematics, something with communication and psychology. Looking hard for a minor and looking at interesting names, I found 'Communication Design for Innovation' (CDI). The name looked very interesting, so I took a closer look.

The name, CDI, already states the purpose of the minor: Learning to develop a communication design for an innovative process. On the website the different courses where stated and the words 'communication' and 'psychology' were very important to me. I read the whole page and I was ready to start this minor!

The first week we started off with a small introduction and what the purpose of this minor is by Eva Kalmer (the minor coordinator) and Maarten van der Sanden, the teacher or the C-lab course. We had to do a test, which told us what kind of person we are in a group project and with these results multidisciplinary groups where made.

We had three courses, Psychology and Sociology in Social Networks (SPSN), a course on

behaviour within social networks, Communication Marketing for Innovation (CMI), a course about communication on a marketing level and C-Lab, the course where we had to solve a so called 'ill-wicked' problem within a real company.

C-lab was the most inspiring course I had ever done. Each group had a real case from a real company they had to solve. My case had everything to do with the civilians of Noord-Brabant and the upcoming environmental law. My group had four people from industrial Design, Applied Physics and Computer Science. It was so new for me to work in a group with all these different people, who don't think the same as me. (My way of thinking after two years of hardcore mathematics: 'What do I need to proof. What can I use to proof it? Proof it'). Using our different backgrounds and our different way of thinking, we developed a communication strategy and made a tool making use of the different theorems from the courses. It was very fun to learn how communication takes place in an innovative process.

If you want to do something with communication and you want to work for real company to solve a real problem? Than CDI will be a good fit for you! You will also get new friends along the way. Maybe you will as excited as me and we will see each other at the master!

CDI

Coordinator: dr. Éva Kalmár

Mail: E.Kalmar-1@tudelft.nl

Faculty: Applied Sciences

Name: Judith Leijenhorst

Study: Applied Mathematics

Minor: Comp. & Innovation

When: 2015-2016

Hey, I'm Judith. I'm currently in my third year of my bachelor Applied Mathematics.

Last semester I followed the minor Economics, Law, Philosophy and Technology. It was quite an experience, for a math student. Here at EEMCS studying is all about getting to understand the theory and practicing excercises, but in this minor was different. I had to read articles, and studying just meant reading more articles.

Something more about the content this minor. The economics part speaks for itself. The law courses were all about laws around technology and how technology changes the law. I found this quite interesting, although I didn't pass all the courses. The last part is about philosophy, only one course of 2.5 EC. Maybe philosophy sounds boring and abstract to you, but this course differed from my expectation. We didn't learn about the old philosophers, but we talked about the ethical part of technology; how far can you go? Is it okay to alter DNA? What will the consequences be?

We also had an Integration course, where all those subjects are intended to come together. This year it was about logics, and as a math student I really liked that.

I chose this minor because I was interested in the law around technology, but I wound up liking the philosophy and the economics courses more. I think some interest in Law is a requirement for this minor, and wanting to know how the economical world works does no wrong.

It is not the hardest minor, there was a lot of students who also followed another course of their bachelor, including me.

The Minor changed from Economics, Law, Philosophy and Technology to Companies and innovation: economical, ethical, juridical and safety perspectives.

Comp. Innovation

Coordinator: Dr. F.W. Guldenmund

Mail: f.w.guldenmund@tudelft.nl

Faculty: TPM

Name: Karim Osman

Study: Computer Science

Minor: Comp. & Innovation

When: 2017-2018

I am Karim Osman, a 22 years old Computer Science student which had the same choice as you, which minor should I do? My choice was Companies and Innovations, a minor of the TPM faculty in Delft. The main idea of this minor is to learn how companies work, and to understand the way managers and entrepreneurs think. This is done by using multiple perspective; Ethics, Safety, Juridical and Economical. It also focuses more on the IT world.

This minor had different courses to achieve this goal. For example, a course that is similar to logics, to learn formal methods for decision making. Another totally different course is the integration course, where you will work in a group of 5 students to make a business plan for your own product.

It is a simple way to learn some basic knowledge about companies, small and large. There are some deadlines you will need to pass, but next to that this minor is really doable. I personally learned a lot, especially during the courses about Law. It is basic knowledge that any professional should have and would benefit from.

As a Computer Science student, this minor will not be a big challenge. It is a different way of learning, but especially the more challenging courses (like business economics) are the easy courses for us, while course like law is unknown territory. Another convenient part of this minor is that it focusses on IT. Because of that, most courses focused on that subject. The Law course, for example, learned us all about internet privacy law and copyright, especially how software cases are evaluated.

To conclude, it is basic minor which is useful for anybody, and easy doable in the time given.

Comp. Innovation

Coordinator: Dr. F.W. Guldenmund

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Faculty: TPM

Name: Linda Leeuwestein

Study: Applied Mathematics

Minor: CSE

When: 2017-2018

Hi, my name is Linda Leeuwestein, and I'm currently a third year Bachelor student, studying Applied Mathematics at the TU Delft.

This year, I did the minor CSE. Seeing as I want to do a master in Financial Engineering, I was also considering a minor in Finance, but rather than focusing on this topic in the minor as well, I thought it would be better to expand my knowledge with computational science instead. After all, CS is a very important aspect in almost every (mathematical) field, including Finance, and I thought it might come in handy to gain experience in this field.

The two numerical method courses were complementary to the introductory course during the major, focusing especially on differential equations. In the scientific programming and parallel computing courses, the focus is mostly on efficient programming, where several programming languages are compared. During the C++ course, the focus is on the actual creation of small programs from scratch, in the C++ language (programs that would be easy to program in a different language). Finally, there is a final minor project, where you and three other students work on an actual (mostly physical) project with a supervisor from a different faculty.

Compared to my major, the level of this minor in terms of difficulty and time spent on attending lectures, and studying at home, was much lower.

In terms of working pressure, this minor can easily be combined with other courses, activities

or work.

The minor is a good combination of studying individually for exams and working together on projects and assignments in small groups. In my experience, the courses focusing on numerical methods were easier for AM students than for CS students, whereas for the programming courses it was the other way around, but by putting in enough effort, I believe they were all very doable for all students.

I would recommend this minor to anyone interested in (numerical) mathematics and programming. I believe this minor is a nice addition to my curriculum vitae and I'm happy I chose this minor.

CSE

Coordinator: Ir. B. (Berna) Torun

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Faculty: EEMCS

Name: Bernard Bot

Study: Computer Science

Minor: CSE

When: 2017-2018

My name is Bernard Bot. I am a 21 year old Computer Science bachelor student at the Delft University of Technology. Last year a followed the Computational Science and Engineering minor.

I didn't know which minor I would like to do. I went to the minor event, but left without anything conclusive. However, one of my friends did. He decided on taking the Computational Science and Engineering minor. He convinced me that it would be a good addition to my knowledge and teach me how to implement complex simulation problems. I looked into the curriculum and found that many of the courses would be easy for a computer scientist, e.g., Object Oriented Scientific Programming with C++; the project at the end of the minor could be a extension of my programming resume.

The first block of the minor was a breeze. It was as I expected it to be: the programming courses didn't take up much of my time. Despite that I underestimated the maths course, which I had to resit. In the second block I was busy with the project and yet another maths course, which was an expansion of the one in the first block. This resulted in a big workload and a large amount of time spent in the university library.

If you are a computer science undergraduate and want to do this course, be aware of the maths requirements. Presuming that the calculus and statistics courses were no problem for you I would recommend this minor. The other students following the minor mostly came from the maths bachelor, for them the maths courses were easy. The programming courses are not advanced enough to pose much difficulty for them. Since they were already familiar with MATLAB they could use it as a reference. When I talked with them about the minor they gave an auspicious response, indicating that the minor is a good fit for their bachelor.

CSE

Coordinator: Ir. B. (Berna) Torun

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Faculty: EEMCS

Name: Erik Wesselius

Study: Applied Mathematics

Minor: Computer Science

When: 2016-2017

Hi there! I'm Erik and I'm 21 years old and in my third year of the Bachelor Applied Mathematics. At the beginning of the year, I was very enthusiastic to start my minor Software Design and Application. I chose this minor, mostly because I had a great time studying for the courses 'Introduction to Programming' and 'Algorithms and Data structures'. Here I learned that I like to program algorithms and small games.

Since I'm an Applied Mathematics student, I was not allowed to have OOP in my minor. Thus, I chose Signal Processing instead. After the first three weeks, I concluded that Computer Graphics isn't my thing. So, I created my own minor. I kept Computational Intelligence and Web and Database Technologies, because those courses intrigued me. Furthermore, added Logic Based AI and created a 3-quarter minor.

The way I chose my minor was based on the given minor Software Design and Application, I took away OOP by adding Signal Processing, which is often done by Applied Mathematics students. Also, Signal Processing is one of the more mathematical courses in the Computer Science bachelor. Because I did not like Computer Graphics and the fact that it's one of the main courses in the practical, I needed three new courses. I chose Image Processing, because I really liked Signal Processing and wanted to know more. I liked Algorithms and Data structures, so I chose Algorithms Design. At last I liked Computational Intelligence, so I wanted to know more

about the course before it, Logic Based AI.

In the first period, I noticed it was hard to follow both courses at the same time, because the lectures were at the same time. Luckily, both teachers were flexible and they postponed my sign in assignments. So, that was convenient. They also gave me two opportunities to take the exam, because they were on the same exact time.

In the second period, I noticed that it was quite hard to follow Algorithms Design, due to the lack of Java knowledge. The essence of the course is easy to follow for Mathematics students, but the practicum is hard and I needed a lot of help to understand the syntax.

Signal Processing and Image Processing were by far my favorite courses, due to the mathematical influence and the fact you needed to program in Matlab instead of Java, I had a great time. Here you get to use everything you learn in the practica. We even learned how to recognize music, even if the quality is compromised.

This minor was previously called ¨Software Design and Application¨

Computer Science

Coordinator: Georgios Gousios

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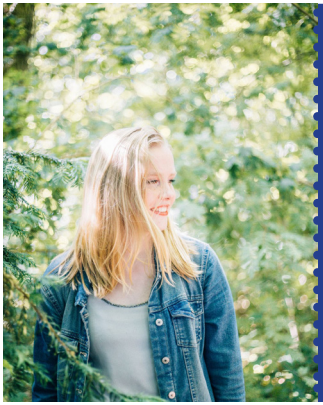
Faculty: EEMCS



Name: Irene Vooijs

Study: Applied Mathematics

Minor: Delta Expert

When: 2016-2017

When I had to select a minor, I was certain I wanted to stay in Delft for another year. But then there are still a whole lot of possibilities. I went to the minor market and spent some time on Google to find out more, and eventually I ended up with two minors to choose from: Software Design at EEMCS and Delta Expert at CEG. I chose for the Delta expert: water for the future, because I wanted to have a less abstract topic for half a year and because there was a very nice field trip to Germany and Luxembourg included, and one course that intrigued me: designing and building your own measuring instrument.

That is what we started with. The first two weeks or so, we researched the region we were going to, next to the regular lectures. Then we all got into minivans in groups and traveled along rivers, visiting sluices, dams, weirs and other water structures. This trip was a week long, and the nicest thing was that we all knew each other at the end of the week, because only about 25 students did the minor.

I learned that water as a topic can be applied in many ways. There were courses about water treatment (which was the hardest course, to be honest), water and climate, water in practice, modelling water streams (which I found one of

the nicest courses), etcetera. The water treatment course had the structure of a 'flipped classroom', which means you have to watch video's at

home prior to the lecture, and then discuss the topic and do exercises in class. Many courses were graded with either a report, a video, or an oral exam, so you do not have many written exams: There was one maple exam (water system analysis) on the computer, and one written exam with measurements for water. At the end of the semester, you'll do a large research about any topic that you found interesting during the minor, and write a report.
I keep good memories at my time across the Mekelweg, not only because of the courses but also because of the group. I really liked how practical the topics were, and it is nice to know a bit more about everything we do with water in the Netherlands, being a country with such a close relationship with water.

Delta Expert

Coordinator: Ir. Wim Luxemburg

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Faculty: CEG

Name: Mireille Kauwenbergh

Study: Applied Mathematics

Minor: Education

When: 2015-2016

Hey! In the first semester of this year I followed the minor Education in Delft. I´m very excited about this minor and that´s why I want to tell you something about it.

My name is Mireille Kauwenbergh, 21 years old and a third year student Industrial and Applied Mathematics. This year began with my minor and at the moment I'm working on my end project to finish my bachelor, it's about modeling traffic networks, but that's not what this text is about.

First let me explain to you why I chose the minor Education. In the middle of the second year I started to look for a minor. Many of my friends wanted to study abroad, but I just wanted to stay here in the Netherlands. First I considered to do the mathematics minor, it's called the Minor Finance, but when I saw the minor Education I immediately knew I wanted to do that. I wanted to have a break from college and learn how to teach other people mathematics. So I signed up for this minor and arranged an internship at a high school not far from my home. In August the adventure started!!

The first six weeks I had two days a week lectures about presentation skills, teaching skills, pedagogy and other courses you needed to be a teacher. We

also had to give small lessons to other students, this was very educational because they gave you feedback and you could learn from their presentations. Besides, you instantly had a group of friends during the minor. Two days a week I was at the high school to get to know the school, my colleagues and the students. Mostly I observed other teachers, but sometimes I gave a lesson myself. The last day of the working week I did my homework. We had a lot of paperwork to do and prepare for the lessons.

After those six weeks I got my own classes and gave a lot of lessons myself, more than sixty! I noticed how easy I could teach mathematics, because of my study. Other minor students had to learn the mathematics books, because they had forgotten the contents. The children also have a lot faith in you, they believe you know everything about math. I loved to work with the children and teach them all the things they needed and wanted to know.

I would recommend the minor Education for everyone who wants to teach mathematics, wants to work with children, isn't afraid to give a presentation and wants to have a great time during the minor!

Education

Coordinator: Corrie Zeeuw

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Faculty: Applied Sciences

Name: Max Spanoghe

Study: Computer Science

Minor: Education

When: 2015-2016

I am Max Spanoghe, studying Computer Science and currently in my 3rd year Bachelor. In this year the curriculum involves doing a minor. For me this was the perfect opportunity to explore other things besides programming and algorithms. I like Computer science but my interests are quite broad and thus I began searching through all the minors that are available. First I thought the minor of Electrical Engineering would be quite interesting in combination with my studies, but then I stumbled across the Education minor. Since I love teaching, this is the minor that I chose. In secondary school I loved teaching hard topics in an easy way so that my fellow students would understand them. Furthermore I coached some younger students when I was in my last year of secondary school. In the minor, I had the option of teaching either Mathematics or IT in the junior classes of secondary education. Since IT is closest to my own studies my preference went to this course.

The quality of the minor was quite high and the workload was not low. In my opinion, if you want to fulfill this minor with high grades you have to put the time and effort into it. The courses in the minor were very informative.

The internship at the school even more so. The most interesting insight I remember from this semester is the fact that even the easiest concepts of Computer Science can be hard to explain in a comprehensive and clear manner. Explaining young children the concepts of loops, variable assignments, sprites, objects, events and so on is quite challenging. The gratification when this succeeds is enormous. Besides the didactical courses you also get pedagogical courses in which you learn how to get students to work, how to measure progress and how to lead them. In addition to this, you take a course on your presentation skills. This course was very instructive and applicable to my own studies in courses like Seminar (where I got an 8.5 for my presentation).

For a student in Computer Science this minor is very fun to do and relates to your own studies. I would recommend anybody with a passion for teaching to look into this. It might boost your career and you get the opportunity to be responsible for a class get them excited about our most beloved sciences.

Education

Coordinator: Corrie Zeeuw

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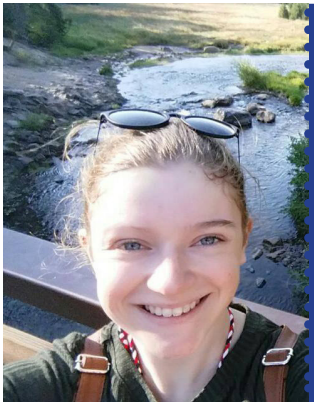
Faculty: Applied Sciences



Name: Iris Kooijman

Study: Applied Mathematics

Minor: Finance

When: 2017-2018

Hi!

My name is Iris Kooijman and at the moment I'm in my third year of the bachelor Applied Mathematics. This year, I attended the minor Finance at the faculty of EEMCS.

The reason I chose this minor is because I noticed that the master Applied Mathematics offers the specialisation "Financial Engineering" which I thought was very interesting, but knew nothing about. Therefore, I wanted to use this minor as a sort of 'preview' of what financial mathematics is and to see if it'd be something for me. I've now finished the minor and have to say that I'm very enthusiastic about this specialisation.

What I loved most about this minor is the fact that you get to see an application of mathematics in the actual world: the world of Finance. I sometimes miss this in the bachelor, so this was very nice. The minor combines theoretical courses with very applied courses, but all courses have a very direct link to the financial world, so the purpose of everything you learn is very clear. For example, homework assignments ask you to perform the theoretical techniques

you learned in a course on real stock data you extract from the stock exchange. Most of the lecturers have direct links with the financial world, which is a nice touch.

This minor is clearly a mathematical minor, the courses use statistics, probability and some partial differential equations, but there are also more general courses, describing the financial markets etc. There's also some programming in R and Matlab involved. For a math student, this minor is very doable. You have to hand in many assignments, but they generally take less time than the assignments of the bachelor. Unlike other minors, this minor does not have any projects that you do in groups.

All things considered I really enjoyed this minor. It's well-organized and a good combination between applied and theoretical courses and I really recommend it if you are interested in the financial world in combination with mathematics.

Finance

Coordinator: Dr.ir. L.E. Meester

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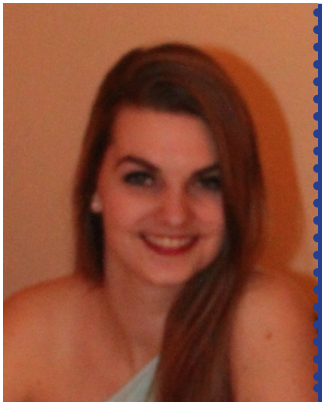
Faculty: EEMCS



Name: Noor van Ruyven

Study: Computer Science

Minor: Finance

When: 2016-2017

Hello, my name is Noor and I'm a 4th year Computer Science student at the TU Delft. For my minor I chose the Finance minor.

I chose this minor because in my first year I started out as a Mathematics student, but soon realized that Mathematics at the TU Delft was way more theoretical than I thought it would be and I really didn't like it. So I switched to Computer Science within the same year. Even though I'm glad I switched, I do still like Mathematical courses, so for my minor I decided to choose courses in that field, also to check whether I made the right decision switching studies.

I have to admit, I thought it was quite a difficult minor. You have a lot of different courses at the same time and all of them have their own either weekly or monthly hand-in assignments, so you were really living deadline to deadline. The teachers and classes were really good, but it was a lot of new information at once and it was often so that the information you learn in one week, you had to control the next for a graded assignment, so if you fell behind it was even more work. But the minor was really nice nonetheless!

I'd say you have a small advantage with a Computer Science background, though most programming you do is in Matlab, which we don't use much, but you're able to learn quite quickly. Other than that, it is really useful to have had the Probability and Statistics course from the second year, because multiple courses use that knowledge.
So all in all I'd recommend this minor to people who have a bit of financial knowledge already, who are good at and interested in Mathematics and who are good at keeping up their studies each week.

Finance

Coordinator: Dr.ir. L.E. Meester

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Faculty: EEMCS

Name: Paul Verkooijen

Study: Computer Science

Minor: MedTech Entrepreneur

When: 2016-2017

Hi everyone! My name is Paul and I'm 23. I study computer science, I am working on getting my bachelors degree. In my free time I row, I love to hang out with friends and have a few beers.

This year I did the MedTech-based entrepreneurship at the faculty of Technology, Policy and Management (TBM in Dutch). When I chose a minor, my main priority was a minor which had as little computer science or math in it to change things up a little bit. I especially wanted a minor which would lay more focus on how to operate businesses and social things, like presenting yourself or ideas, and working in groups. Finally, since my interest in biology, care and wellness I chose the MedTech variant over the Tech variant.

When the minor started, we had one half year project. During this project, you begin your own start-up with a group of 3 to 4 people. This start-up should be some product or service that is useable in healthcare. This project is supported by other courses. The knowledge gained from each course, should be used in the project. Some courses taught us about healthcare, its economics and how to measure it. Others focused on design and doing research for your product. Some things I've learned are finances, brainstorming, designing, working in groups and pitching. Only a few weeks were

really time consuming due to deadlines, but most weeks you had loads of free time, in which you can work on your start-up.

I would recommend this minor if:

- You want something completely different than Computer Science or Mathematics. It is not a difficult minor, but you will learn a lot of things you will need at EEMCS.
- If you like a creative minor. One course is from industrial design, you have to do a lot of brainstorming, think about how to promote and sell your product and so on.
- If you are interested in starting a start-up.
- You like working in groups and everything that comes with, like giving presentations, having meetings and writing reports.
- If you want a really social minor. Every course you work with the same group, so you never have to work alone.
- If you like having a lot of freedom. I had only a few classes a week, of which only one was mandatory. The rest of the time you can work with your group on the different projects, but these times are not planned and are your own responsibility that you do something useful with it.

MTE

Coordinator: Drs. J. Spaans

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Faculty: TPM

Name: Sven Popping

Study: Computer Science

Minor: Modern Physics

When: 2016-2017

I'm Sven Popping, 4th year Computer Science student and I'm 22 years old. This year I did the minor Modern Physics. Why did I choose this minor? The real reason was that I wasn't selected for my first choice. This meant I had to select a minor that was still available in the second registration period. Well that ended up being the minor Modern Physics.

At AS (Applied Sciences), they work with a systems of octals instead of quarters, so this means that you will have two exams every five weeks instead of the habituated three exams every ten weeks. This means studying quite a lot every week to keep up with the courses. At first I thought this was horrible because I was not used to it. The advantage is that you do not have to study extra for an exam, because everything you need to know is still fresh in your memory.

The level of difficulty differs a lot per course, because your following a few first-year courses which are still a little bit high school like. The courses contain a lot of mandatory lectures and tutorials and it is likely you will pass these courses.

But the other courses are quite hard, because they expect you to have a background knowledge or knowledge from first or second-year courses and these need a lot more effort.

One main disadvantage, if you are an international student, is that some courses are given in Dutch and some material for the courses is only available in Dutch.

But if you are interested in topics like Theory of Relativity, Quantum Mechanics, Thermodynamic and are quite good at math then this Minor is probably a good fit for you.

Oh, and you can do experimental with liquid nitrogen.

Modern Physics

Coordinator: Gertjan Broekman

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Faculty: Applied Sciences

Name: Maarten Vonk

Study: Applied Mathematics

Minor: PHD

When: 2016-2017

Hello everyone,

My name is Maarten Vonk, I'm 21 years old en I'm studying Applied Mathematics. This year I'm doing a minor in Psychology of Health and Disease (NL: Psychologie van Gezondheid en Ziekte) in Leiden and that's what I want to tell you about.

I chose this minor because I wanted to learn more about people, understanding people and knowing why we think and do the things we do. I'd say that goal is pretty much accomplished, I'm not as far as I wished I would have been, but still a lot further.
In this minor I also learned a lot about mental disorders, stress and about myself.

This minor doesn't have a lot of scheduled hours. So it's mostly working at home and attending colleges, there are also a few courses in which you'll have group meetings.
The minor, on average, is not very difficult. For me the most difficult thing to

do was being able to work with discipline. I tend to procrastinate a lot when I should be studying at home. But on the bright side, this year I was confronted with that, because I had to work at home a lot. So now I learned how to deal with it.

Psychology is very different from Mathematics and Computer Science.
I think it's good for people like us to learn more about Psychology.
So, if you're interested in Psychology and you want to do something different from the Beta studies in Delft for a change, maybe this minor would be the right choice for you.

One final thing. This minor is spread over the entire year instead of the first half. But I realized, a bit too late for me, that this minor can be combined with the minor 'Mind and Brain', then it's all in the first half of the year.

Good luck and enjoy your minor!

PHD

Website: www.leidenuniv.nl

Faculty: Sociale Wetenschappen

Name: Eva Anker

Study: Computer Science

Minor: Robotics

When: 2015-2016

I'm Eva Anker (20 years) and I did a minor Robotics at 3mE for my bachelor Computer Science.

In this minor, we worked in a multidisciplinary team with one Computer Science, one Electrical Engineering, one Industrial Design and two Mechanical Engineering students to build a robot.

The first half of the minor I mainly had some courses from Industrial Design and Mechanical Engineering and the second half we mainly built the robot. The subjects of the courses was not that interesting, but it was nice to see what other studies learned. In our group we made a guide dog who could autonomously cross streets, but there were also other robots developed, for example mosaic- or insomnia-help- or raspberry picker robots.

I chose this minor, because I'm interested in robotics and I liked the fact that I was in charge of all the programming in this project. Supervising the others seemed like a good learning experience.

The minor is a lot of work, mainly because all other group members think they can program, but they can not. In the last week there is a lot of pressure on the Computer Scientist, because everything except the software is finished. Some parts can only be made/tested when the robot is finished.

In the second half of the minor, my main job was to program the robot. Most groups use C++ with usage of the Robot Operating System. Because of all the programming, I could use a lot of knowledge from my bachelor. The programming was something we had to figure out ourselves, with help of a coach (every group was assigned a coach).

Overall, I liked the minor. Building a robot was a lot of fun and working in an interdisciplinary team was very instructive (other values and thus opinions). I would recommend this minor to all Computer Science students with affinity with robots and whom like to work in a team.

Robotics

Coordinator: Msc. Martin Klomp

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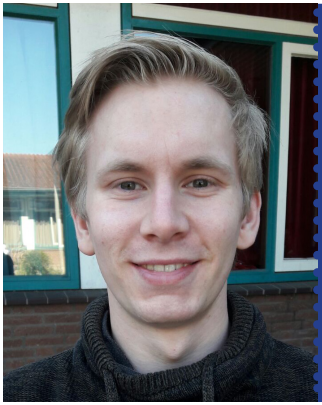
Faculty: 3mE



Name: Sigur Gouwens

Study: Applied Mathematics

Minor: Spaceflight

When: 2016-2017

Hello, I am Sigur Gouwens. A third year applied mathematics student who followed the minor Spaceflight.

The reason I chose for this minor is because I was always fascinated with everything that is in the nightsky. I wondered why some stars sparkled, what they are made of and why they do what they do.

Because of this, the course `Astronomical Exploration', was a very enjoyable course. Every week you learn about another subject. For example, it's explained how the age of the universe is determined. But also how black holes form and what happens when you fall into its event horizon. And a little closer to home: during the lectures on planetary science, the solar system is discussed. You will find out that it has changed over the years, and how this is known by looking at the composition and masses of the planets.

This is not all, spaceflight is a lot more than just astronomy. Sometimes people are more interested in getting there, sometimes to stay close to earth for earth observation but also to get to other planets. These topics are discussed in the courses `Earth Observation' and `Spacecraft Technology'. In the first course, methods to observe our own planet are taught and once you know how it works you can make your own measurements. I measured the change in vegetation over a period of ten years in Europe. But the possibilities for this assignment are

almost endless. For this you do need to use a very specific programming language but it will work eventually.

During the course 'Spacecraft Technology' you learn about almost all aspects of a rocket and how they work. A very important part is that a rocket or satellite knows where it is and what its orientation is, otherwise it will be hard to reach its target of make its observations. Next to this and different propulsion methods, alot is taught in this course and after this you will be a true rocket scientist!

There is also the course Spaceflight assignment, here you can choose a space project by yourself. Plenty of these require programming skills (C++) to correct bitflips caused by the radiation of space, but also to predict orbit changes using numerical methods. There are topics in pretty much all directions so there will also be one for you! And yes. You can also build a water rocket if you like to be creative.

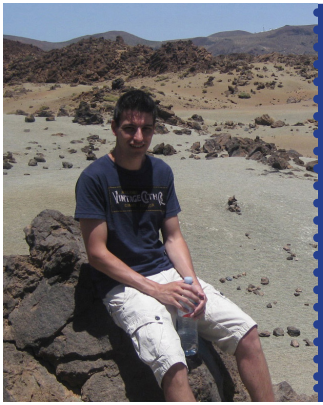
But, this minor is not an easy one! There are weekly assignments to be handed in, sometimes up to four so the workload is high. Because the minor is fairly new, there are still may things that need to be improved. One of these things is the distribution of workload. Another thing is that they seem to favor online lecture you have to watch yourself, but if you don't mind watching most of your lectures on Collegerama, it should be fine.

Spaceflight

Coordinator: Ir. J. Bouwmeester

Mail: Jasper.Bouwmeester@tudelft.nl

Faculty: Aerospace Engineering



Name: Hugo Kooijman

Study: Computer Science

Minor: Spaceflight

When: 2017-2018

I'm Hugo and I follow the Computer Science programme at TU Delft university. As I started studying fairly late in my life, at age 29 I'm considerably older than the average student.

Even with the time gap between now and my physics courses at high school, I was able to follow along with the course material of this minor. The teachers are very helpful and happy to explain anything you don't understand. You're assumed to know nothing of astronomy, but are expected to know at least some physics and calculus. Especially CS students will probably need to do some googling, or ask other students, as most applicants to this minor come from faculties that do deal with physics.

There are weekly homework assignments for most courses, so you'll get much practice. I'm used to CS' workload and it seemed no different than a normal CS quarter (not as busy as Y2Q3 though, that CPL gave me sleepless nights). Be prepared to apply many formulas and to solve many equations; it's what every course is about. Some courses also do some programming (JavaScript, Arduino/C) or MatLab. And the Spaceflight Assignment at the end of the minor allows you to choose from a few programming projects. For that I made an Error Detection And Correction algorithm testing environment in C++.

One reason I chose this minor is because I wanted to know more about our universe, about the Big Bang, stars, black holes and anything else that resides within. Another reason is that the spaceflight industry is booming nowadays with what seems like a new space race. And this is exactly what I learned about and more, including rocket science, satellite communications, exoplanets, the birth of our solar system, etc.

And so I recommend this minor to anyone that wants to know more about the universe we live in. You'll even complete some courses that are required to become a space engineer. If you can do CS, you can do this minor as well.

Spaceflight

Coordinator: Ir. J. Bouwmeester

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Faculty: Aerospace Engineering

Name: Emiel Rietdijk

Study: Computer Science

Minor: SSJ

When: 2016-2017

My name is Emiel Rietdijk, I'm 24 years old and I pursue a bachelor degree of Computer Science. Last year I have chosen to follow the minor: Security, Safety and Justice. This minor is part of Public Administrations of both the TU Delft and University of Leiden.

The year I had to choose my minor the news had a lot of impact on my choice. Lately there has been a lot of attention given to safety and security issues. Not only are there issues with terrorism, but there had been a lot of data leaks by companies, even really big companies. This made me want to know more about how this could be prevented and how companies can let this happen. I stumbled upon the minor SSJ and this appealed to me.

The minor has about the same difficulty level as a normal study, but it is way different than I was used to. The first thing was that the lectures were mandatory, but on the other hand there were only two days of lectures. Furthermore the practical assignments were all about writing papers, which I was not used to do. Besides the two days of lectures I needed about two days

of working on papers en preparation for the lectures, which gave me about the same time schedules as my bachelor.

As a student of Computer Science this minor was totally new to me and there was barely anything that I had seen before in my bachelor. The way the lectures were given, the practical assignments and the study material were all different. However, this gave me new ways of thinking and it has improved my skill of writing papers, which always comes in handy.

I would recommend this minor to people who are interested in how companies and governments handle safety and security issues.

SSJ

Coordinator: Dr.ir. W. Pieters

Mail: W.Pieters@tudelft.nl

Faculty: TPM

Name: Tom Harting

Study: Computer Science

Minor: TBE

When: 2016-2017

My name is Tom Harting and I'm a fourth years Computer Science student. During my board year at CH, I found out that I really like to be my own boss and the entrepreneurial challenges that come with that. This is why I chose to do the minor Technology-based Entrepreneurship at TU Delft.

In my experience, the minor gives a good overview of what it is like to be an entrepreneur. It does this by introducing a central project in which you work together with your team to come up with a business idea and a business plan. All the courses surrounding the project are meant to help you with this, for example courses on brainstorming or financial management.

In my experience, the workload for the minor is a lot lower than that of the Computer Science bachelor, as was the difficulty of the courses. I didn't use a lot of the skills that I learned during my bachelor in this minor, since the product that you worked on needed to be a physical object (so no software product).

In general, I think the minor is fine. There were quite a lot of organizational problems, but those were partly due to the different teaching techniques which are used at TBM. I would recommend this minor for students who obviously have some kind of affection with entrepreneurship, who are not afraid to go out and talk to a lot of people about your project, who don't mind writing reports and who don't mind following courses that aren't 100% planned out. Also, I would say that you learn quite a lot in the minor as an EEMCS student, but that it isn't that difficult.

TBE

Coordinator: R.A. Kievit-Brinkman

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Faculty: TPM

Name: Eveline de Swart

Study: Applied Mathematics

Minor: TIL

When: 2015-2016

My name is Eveline, I'm 21 years old and in my fourth year of the Applied Mathematics Bachelor. I followed the minor Transport, Infrastructure and Logistics (TIL).

One of the main reasons I chose the minor TIL was because I am interested in logistics and from what I understood from the description this minor was a combination of mostly Civil Engineering and a little Technology, Policy and Management. However, this turned out to be the other way around. Besides the fact that the distribution of study fields turned out different from what I expected, the focus is mostly on transport and infrastructure and barely on logistics. I could have known this if I had looked up the subjects in the study guide.

I considered the group project in the first week the most interesting part of the minor. We had to come up with a design for the improvement of the train station Delft Zuid. This project was introduced by someone from the municipality and our ideas were send to the committee working on Delft Zuid

so they could possibly use them in the actual improvement of the station.

In my experience, the minor wasn't very challenging, especially in the mathematical area. Most of the subjects don't contain math and if they do it is a lot easier than what I was used with AM. Throughout the semester you have several projects which aren't extremely difficult, but can be very time consuming. Compared to AM you don't have a lot of contact hours, but the spare time is necessary for these projects. For all the projects you are working on, you have the same group which makes the distribution of the work easier. This minor turned out to not be the best choice for me, but if you want a minor with somewhat less mathematics and a lot of group work, it might be the right choice for you.

TIL

Coordinator: Dr.ir. John Baggen

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Faculty: CEG

Name: Menno Looman

Study: Applied Mathematics

Minor: Zeiljachten

When: 2016-2017

Past period I, Menno Looman, attended to the minor 'Zeiljachten'. I'm a 20 year old student in my third year from the bachelor Applied Mathematics. The minor isn't obvious for a math student. In my year, out of the 50 attendees, two were math students. Even more important, I didn't even know how to sail. I personally chose it because I wanted to do something different than mathematics, to do a big group project, and to build something instead of only modelling it.

For a math student, the first week is the hardest. The course 'Inleiding Maritieme Techniek' is a recap from the Physics we had in high school applied on sailboats. The rest of the first quarter is doable for every student on the TU. Here you learn the basics about how you can calculate everything, you learn how to use a 3D program 'Rhino' and to model a sailboat. This is an awesome skill to have! A few disappointments for me you need to know: you don't use your mathematical technics, teachers integrate strange, use strange variables and reason with "We think it is small, so take k=0".

If everyone is happy with the projects, you take this group to the second

quarter. In this 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. Then the brainstorming for the race begins. You model (and calculate!) your ideas. Give it more detail. Lasercut the easy parts. 3D print the difficult parts. Build your whole model and finally race at the Marin. There we raced against nine other TU Delft teams and four RMU teams. The race will take the whole day, you get a tour, drinks and you can invite someone. We won the race by far, something I didn't believe was going to happen if you asked me six months ago.

Zeiljachten

Coordinator: Lex Keuning

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Faculty: 3mE


TUDelft