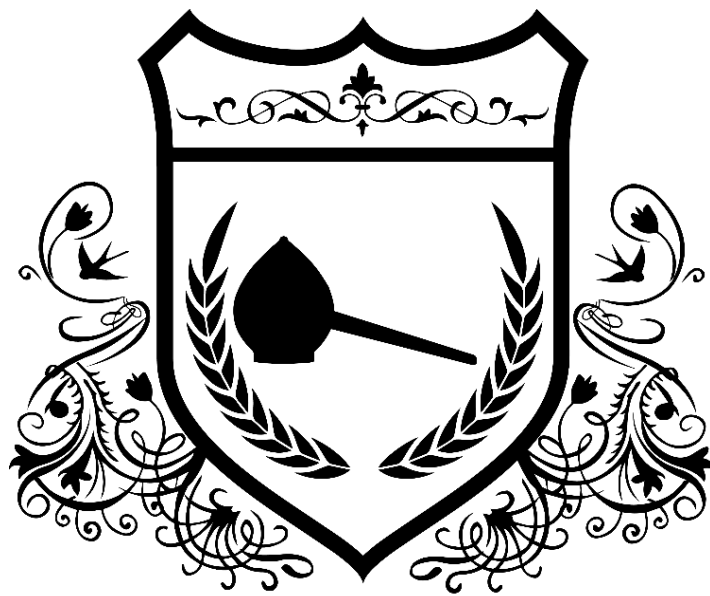


# CSE minor experience guide 2023



**C.T.S.G. Alembic**

**EST. 1965**

## **Introduction**

Dear minor-orientating student of CSE,

If you are reading this, you are probably looking for what minor you are going to do next year. This guide has been set up to assist you in this process. Next to some general information about choosing minors, this guide contains the experiences with several minors that are often followed by CSE students of students that followed them this year.

### **General information about minors**

All of the relevant general information can be found on the site of the UT, accessible via the following URL: <https://www.utwente.nl/en/education/electives/minor/>. Next to information about the different minor options, requirements and registration, this webpage also contains a minor search tool. Here you can select your study programme, after which it shows you all minors you are allowed to take. By clicking on a minor in this list, you are directed to the relevant course information. It will be possible to register for minors of the first semester of 2023-2024 from March 22 (starting 1 PM), the end date has yet to be determined. For the minor 'leren lesgeven', the deadline is April 12.

### **Experiences of CSE students**

In this guide, the experiences of numerous students that have done their minor in previous years can be found. You may use it in combination with the minor tool of the UT to inform yourself about minors that interest you.

Good luck with your minor choice!

*Jip Hoogland*

*Commissioner of Educational Affairs*

*C.T.S.G. Alembic*

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## M5 Mechanical Engineering – Dynamic Systems

### **Overview**

Name: Niels Loman

Organizing study: Mechanical Engineering (ME)

Module: M5 – Dynamic Systems

### **Motivation**

When choosing a minor, I wanted to do something that I liked, could learn and challenge myself in new disciplines. I also wanted to do something technical with calculations and solving equations. Then I saw the minor experience piece of Wisse Hersbach and it looked really interesting to me. I think the course had both its fun and fewer fun parts and offered me some challenges here and there. Jordi Boon did the same minor and I knew some other minor students, which was nice to make the exercises together. The courses challenged me to think differently sometimes than we do at CSE.

Originally this module also contains Vector Calculus, so a replacement for this subject is needed. For this course, the subject Dynamics 1 requires some prior knowledge: the subject Statics. This can be easily arranged. Because Statics is not in the regular module but in the first module of ME, some lectures might overlap. Something to take into account, the resists for all courses are in January.

### **Course experiences**

- *Statics (2EC)* is a subject that is really similar to the physics of forces that you followed in high school. It is a pretty easy subject that covers the beginnings of Newton's laws, like 'action = reaction'. The general description of this subject is  $F_{res} = 0$ , which is used to solve equations. I did this course on self-study and just doing the exercises was sufficient to have enough knowledge for the exam. The rooster overlap is therefore no problem.
- *Dynamics 1 (4EC)* is the same as statics, but now  $F_{res} = m * a$ . The goal of this subject is to describe the movements of different things. While I found the subject quite fun, the exercises were quite challenging. The course is well organized, the lecturer is nice and gives great lectures. This subject can however be quite time intensive since you really need to make the exercises to succeed in the subject. For mechanical engineering students, it is a feared course.
- *System analysis (4EC)* is a course with signs of electrical engineering. The course is all about signals and how to analyze them. Now, this may seem quite difficult, but the lecturer is great and there was enough and good study material. It is quite a different way of thinking, to tackle problems.
- *Project design principles for precision mechanism 1 & academic skills (5EC)* consist of a course and a project. In the course *precision engineering*, you need to think in 3D. It is a lot about how to constrain movements of an object, without creating friction in the structure. Although the course was easy, there were not a lot of exercises. The *project* was about designing a mechanism for an object which has to move in given directions. The project was next to precision engineering also about system analysis and a bit about dynamics and was a small project. However, the organization was not good. There was almost no TAs at supervised self-studies while everyone had questions.

### **Time-intensity and comparison to CSE**

Overall, the module requires you to do put in the effort and it is a no easy EC minor. However, when you do the total intensity will be much lower. Especially the dynamics course is challenging. The module is quite doable in terms of time consumption and is a nice extension of our program. This minor allows you to work with forces, which we normally do not.

## M5 Industrial Engineering and Management – Finance for Engineers

### **Overview**

Name: Job de Swart

Organizing study: Industrial Engineering and Management (IEM)

Module: M5 – Finance for Engineers

### **Motivation**

I chose this module for several reasons. First, I still had to redo a course from module 5 and I wanted to combine this within my minor. Therefore, I didn't want to do a minor with full lecture weeks and a lot of mandatory presence. Furthermore, I wanted to do something totally different than Chemical Engineering for a chance. I always liked business and economics in high school and I was eager to experience some university level courses in this field. Finance for engineers seemed to be the ideal option.

### **Course experiences**

- *Accounting and finance* was the main course. I think we generally had one or two lectures per week, plus some self-study. These lectures also were the most crowded ones, with over a hundred attendees. Sometimes the lecturer had trouble with the volume of the crowd, because most students were less focused than you would expect with CSE lectures for instance. Besides that, the lectures were clear and good to follow.
- *Option pricing* is an interesting course; however, I believe it could have been better with another lecturer. This lecturer spoke very fast with a thick accent, which made it difficult to follow. There was one exam together with *accounting and finance* which was mostly multiple choice. In preparation there was a practice exam which was quite representative.
- *Methodology* was a vague course mostly concerning the general methodology of observational research and questionnaires and such. I didn't go to many lectures, since I did not find them useful. There were some group assignments and a multiple-choice test which were all not that hard.
- The *Project* for this module was quite extensive but fun. In the beginning we participated in an investment game where the goal was to make profit of investing with fake money in the actual stock markets and you had to justify your strategies. This was an entertaining way to put the learned methods of finance and option pricing into practice. Furthermore, there were some extra assignments followed by a large written essay. Overall, a nice project to do.

### **Time-intensity and comparison to CSE**

Compared to CSE, there were very few contact hours and the self-study was not that hard to do. Overall, I think I spent half as much time with this module as I would do with a regular CSE module. No previously obtained knowledge for CSE was that relevant, although there were some statistics exercises. And I think anyone from CSE could follow this module without having an economics background.

### **Relevance for your study**

I mostly learned about the basics of market strategies of companies, as well as financing and accounting. Furthermore, I learned about investment strategies on the stock markets. Overall, I was very satisfied with this minor.

## M10 Electrical Engineering – Lab on a Chip

### **Overview**

Name: Job de Swart

Organizing study: Electrical Engineering (EE)

Module: M10 – Lab on a Chip

### **Motivation**

I chose the lab-on-a-chip module mainly to freshen up my lab skills and other relevant knowledge before doing my bachelor assignment. I previously did a board year and the finance for engineers minor, so I thought that might be necessary.

### **Course experiences**

The setup of this module is quite interesting actually. There are no real courses, but you get taught by Problem Based Learning. You are assigned to a 'PBL' group of approx. four students of random educational backgrounds to solve an assignment (or problem) every day. In the morning there would be some introduction on the topic and some literature background and then you had to solve the problem yourselves and present the result to the group at the end of the day. The topics were in the field of pumping and mixing, mass transport, microfabrication, electrochemical and optical sensing, cell biology and some statistics. This was guided by the staff of BIOS, who are all very fun and involved people.

After a few weeks the project started, where you and your group had to design a chip after doing some literature research. Then guided by your supervisor you had to fabricate and test this chip and make a final report and presentation about your findings. In essence, it is very much like a bachelor assignment which you do with a group instead of on your own.

Furthermore, there was a written exam at the end of the module, which was quite extensive, but very well to do with the knowledge from the PBL sessions.

### **Time-intensity and comparison to CSE**

The module was very time intensive. Essentially the whole module follows a 9 to 17 mentality with mandatory presence every day. However, outside of college hours you didn't have to worry about studying for exams or doing assignments. But be prepared that you are going to spend a lot of time on campus with this module.

The content of the module relates very well to CSE, but now mostly focused on micro scale. You also learn some new topics in the field of cell biology.

### **Relevance for your study**

I really liked the Problem Based Learning in this module. It requires you to immediately dive into the learning aims of the topics in a fun and competitive way that is way more interesting than boring lectures. You also get used to the time scheme very quickly, but it can be annoying to sit in the same room with the same small group of people day in, day out.

Overall, I really enjoyed the minor and learned a lot about micro chip fabrication with BIOS.

## M6 Advanced Technology – Materials Science and Engineering

### **Overview**

Name: André Pul

Organizing study: Advanced Technology (AT)

Module: M6 – Materials Science and Engineering

As I had followed the process design track in module 8 of CSE, and I was not sure how the material track would be and had kind of bad insight into what to expect from that anymore, I chose to follow the Materials Science and Engineering module of AT as my second minor module. This allowed me to leave the option to choose the materials or nanotechnology track in the master open, if I would prefer the materials part of the study over the process part.

This module had not a lot of class sessions, and only for the Semiconductor Devices and project courses there was some self-study besides the planned tutorial sessions. Most of the free time can be spend on the project, but as the project consists of two parts, exploring the material properties and the chemistry, and only the material properties directly can be applied after the first few lectures, it was not very easy to start on the chemistry part. For the project you need to investigate a certain material it's material properties and the chemical techniques that are used in industry to make this material. The chemistry part is equally weighed as the materials part, but only in the later sessions of Chemistry and Technology of Materials (CTM) it really starts becoming relevant.

The Advanced Materials course is focused on the material properties, like magnetism, the dielectric effect, mechanical failure of materials. The thermal properties part of this course is where it gets abstract with the diagrams that are discussed only during the lecture (not in the book), with the dimensions in the reciprocal space. Personally, I had a hard time trying to understand it very thoroughly, as I also took the liberty to work this out for the properties of the material of our project. The schedule is well made for this course, as after the lecture there is a tutorial planned where you can practice on the subject learned.

In Fundamentals of Solids (FoS) you delve into the phase diagrams and learn about how to read them. In the second part you learn about the diffusion processes that happens in solids, the different structures possible in ceramics and certain surface analysis techniques. Some of this was already treated in the first year of CSE, but it is a nice recap of how it worked again. This course is doable if you just keep up with the tutorials that you get.

Now for the CTM part of the module, the first 6 lectures were given by Mark Hempenius, which some of you might already know from your previous classes. He treats the polymers part of this course, and this was mostly a recap from the CSE Polymers course, but I think part of the Polymers course got changed the last few years. After Mark Hempenius' lectures, you will get lectures about different chemical deposition techniques and ways to create ceramic materials. This is usually given at the same time you get the ceramics part of FoS, which makes it more interesting. However, as this is important for your project, as already mentioned, the way of scheduling seems a bit off. So, I would recommend having made some progress with the materials part of the project so more time can be put in the depositional chemistry of your material.

Last but not least, there is the subject of choice: Semiconductor Devices (SD) or Physical Chemistry of Interfaces (PCI). However, there was some uncertainty about which subject you must follow as a student from CSE, as PCI is comparable with the course Colloid Chemistry. SD is something you did not

have before at CSE, but it is doable, and maybe even requires less time investment than PCI, as there is only 1 exam and 1 essay that need to be done, while at PCI there are 3 exams and a practical.

If I had to compare this AT module with a CSE module, I felt it was less time consuming than most modules. There is a lot of free time, of which some you should spend on your project, but still there is plenty of time left. Some courses that are given are partially a recap of previous CSE modules, which makes it easier to get grasp of the initial concepts. Overall, this module is structured alright with quite some internal coherence here and there, although the chemistry part of the project is given a bit late. The lecturers really try to help you understand the subjects.

After all the courses, I realized that the materials track was not something for me, as it is mostly abstract thinking, and not very much calculations that need to be done. Therefore, it is useful if you are struggling with your choice of master's track.

André Pul



## M1 Technical Computer Science – Pearls of Computer Science

### Overview

Name: André Pul

Organizing study: Technical Computer Science (TCS)

Module: M1 – Pearls of Computer Science

In my first minor module I followed the Pearls of Computer Science minor. The first lecture sessions we had were in the cinema off-campus, as a lot of first years choose to follow the Technical Computer Science study. Normally, if there is no conference on-campus, you will have college in the Waaier 1 and 2. In total there were around 300 people attending the course, which is huge compared to Chemical Science and Engineering.

The reason why I wanted to follow this minor was because I wanted to develop some of my programming skills and see whether a more programming related study would have been something for me. I already had some basic programming knowledge, as using Matlab is part of CSE, and I also had messed around with Python and C++ before. This came in handy after the first week.

The first module of TCS is mostly focused on using Python as a programming language, but it first starts with messing around and programming your own Arduino kit (which is provided to you). For this Arduino kit you end with programming a song on a buzzer (e.g. Darude Sandstorm), as you have learned a lot about the architecture during the lectures and the way the Arduino is controlled by commands from a script during the tutorial.

As every week is about an almost completely different subject - a pearl of computer science - I am not going to elaborate on the other weeks, as the general description of each week is provided on the TCS utwente website for prospective students. On a more general note, I can say that every week is filled with new knowledge of computer science, and you really need to get hold of the concepts within the week. Some subjects will suite your interests more than others, so some of them will be easier to follow than others, but you need to finish all of them with a passing grade. This can take quite some of your time if you are really struggling with a certain concept, but luckily you also have a partner with which you can work together to get hold of the subject.

Every week you work in a group:

- In the first 7 weeks, you work with one other student, which is randomly assigned to you, on the tutorial exercises. The tutorial exercises fit the two/three lectures you get usually quite well, but if not, you can always ask one of the teaching assistants for help if you are stuck. Every week you get the chance to improve your exam grade by 1 point by some extra exercises, which really test your knowledge. Some of the tutorial assignments need to be signed off, and it is important to get these done before the end of the last tutorial session. This puts some pressure behind your performance, but it also keeps you more motivated to finish it early. Every week is concluded with an exam.
- In the last 2 weeks, you work together with five other students of your own choosing on a project. Most students work on making a twitter dashboard for a certain event like the Batavierenrace, but you can also decide to choose a project that is about the use of RFID tags which is related to security. However, only the twitter dashboard has a good description of what should be done, and the security dashboard is more open.

The last week is open for repairs, but if you manage to successfully complete all the previous weeks, this is a week off. The time intensity in general is very situated in the working days, and you usually have not much you can do during the weekends, which is quite nice.

Besides these general groups, the students are sorted into different 'houses', which is mainly used to distribute the students over different rooms for tutorials and exams. As a minor student we got assigned to the blue house, but the communication towards us was not very clear, as the houses are mainly for the first-year students.

A main disadvantage of following this course was that you need to do a replacement course for Mathematics, as the math the TCS students get is already treated in the first year of CSE. This is a course about proving statements, which is quite abstract and is almost completely self-study, which can consume quite an amount of time. Also, as your partner for the tutorials during the first weeks are randomly assigned to you, it can sometimes happen that your partner is either very good in programming, or you will have to carry the main load of the week to finish it successfully. Something I want to add to this is that it can happen that your partner shares his code with someone else, and this can get you both screwed up. My own partner in the first week shared his code for the bonus assignment with one of his friends, for which we 'only' received a warning and got tagged by the staff and also lost our bonus point.

Finally, I want to make a note that you get to learn a lot about programming and computer science in just this one module. Personally, I got to know how to work better in Python and got better insights in how computers and programs work in general. This module is doable if you go to all the lectures and tutorials that are given, as most of the exercises can be finished within these planned hours, but this is also due to it being a first-year's module, so everything is still very basic. I also learnt that I like programming, but it is not something I want to do all week, so I made the right choice for my study.

If you have any questions about some specific parts of this module, for example the other weeks which I did not describe, feel free to contact me.

André Pul

## M9 Electrical Engineering – Energy transition perspectives

### **Overview**

Name: Lara Jansen

Organizing study: Electrical Engineering (EE)

Module: M9 – Energy transition perspectives

### **Motivation**

Energy transition is a very important topic and will be most likely be a part of my future work. Therefore, I wanted to get a broader view into it. This minor gave me the opportunity to look at the topic for more than just the technical side. Next to that I wanted to know if I found the topic interesting enough to do something with it in my masters.

### **Course experiences**

The course was set-up in 5 blocks of 2 weeks. There are 5 different topics,

*Global perspective:* This block focused on the significance of the energy transition and how different people think about it. It also discussed how people are convinced to cooperate

*Electrical power:* Here the focus is on the influence of renewable energy on the net. But we were also taught the important things about setting up mini solar grids.

*Renewable energy technologies:* Here the working of different RET are explained and is shown how to do simple calculations for this. Think of topic such as wind energy and Biomass.

*Energy storage technologies:* This is the block that is most similar to CSE. Lots of different storage technologies are discussed such as Redox-flow batteries and mechanical storage.

*Mobilising for sustainable change:* Here it goes back to the social side of things. A view was given into leaderships styles and it was discussed how change in companies or industries is handled by all different levels of employees.

Overall, all the topics are interesting, but not all as technical as CSE. All the course block close after the 2 weeks with either a test, project, assignment or a presentation. Some even with a combination of these. There is a lecture almost every day and missing them, does make it difficult to pass the examination because there is not really any course material yet. I followed this course when it was a pilot module, therefore I am not sure if they are going to change the set-up. I general I really liked this minor.

### **Time-intensity and comparison to CSE**

I did not find any block too difficult, I think it is doable for everyone with somewhat of a technical background, if you go to the lectures and tutorials. The study load is mostly equal or less than that of a typical CSE module. Last year there was a completely free weekend every 2 weeks which was great.

## M1 Business & IT – Introduction to BIT

### **Overview**

Name: Maarten Duikersloot

Organizing study: Business & IT (BIT)

Module: M1 – Introduction to BIT

### **Motivation**

My motivation for BIT was to be able to understand more about finance in a process engineering perspective and to combine this with programming.

### **Course experiences**

The course was set-up in 4 subjects: introduction to BIT, introduction to computer science, research methods, a project and in our case an elective 4 EC subject since we already did the calculus of this module.

*Introduction to BIT:* This subject is really easy only basic middle school economics stuff and you can probably pass it with minimum effort. Not really interesting or appealing for me. I hoped the finance part would have contained more interesting stuff.

*Introduction to computer:* programming in python, Java and a computer networking part. Teacher is really good was a former Apple programmer. Only the basics of the languages are touched but I would say in the end you can program these on MATLAB level. Useful if you would like to do something with programming during your bachelor assignment.

*Research methods:* Most of this subject you already know from Hanneke Becht. It teaches how to do research and how to use the different search engines provided by the university.

*Project:* During the project you and your group will develop an application for a hotel. A lot of creativity can be used here and it was very fun overall.

*Mathematical analysis 4 EC:* If I could one thing over again, I would not have picked this subject. This course is offered by the university as good replacement if your study already did the math part of a minor but this course is a part of the pre master of the mathematics study. I thought it was too difficult for the number of ECs and the teacher does not provide answers for any of the exercises. Do not pick this if you are mediocre at Mathematics like me.

### **Time-intensity and comparison to CSE**

Overall the programming was fun the other courses of this minor I thought were very easy and doable if the time is put in. For anyone who is going to do BIT I would recommend to find a different 4 EC elective to replace the mathematics course with since the one I picked was very difficult. The time-intensity is definitely lower than an average CSE module.

## M2 Civil Engineering – Water Management

### **Overview**

Name: Niels Loman

Organizing study: Civil Engineering (CE)

Module: M2 – Water Management

*Disclaimer: Some of these courses might have overlap and cannot be chosen, please contact BOZ for details*

### **Motivation**

Same as for my first minor, I wanted to do a technical minor. I also had housemates which do Civil Engineering and recommended this module. I followed the course Water in my board year and I really liked the course, so later I decided to do the whole minor. This module contains Calculus 1B, so a replacement needed to be found. I chose the standard math replacement Introduction to Mathematical Analysis. Overall, some courses I liked and some a bit less. The module consists of a lot of small courses, which means a lot of exams and deadlines during the whole module. The study and module is a combination between technical and political.

### **Course experiences**

- *Water (2,5EC)* is a course about analysis of reservoirs, forces on a dam and water quality with chemicals. I did this course on self-study which was really doable.
- *Fluid Mechanics 1 (2EC)* is a bit similar to our Fluid Dynamics, but only on hydrostatic forces and Bernoulli's law with and without friction. So, for us it is easy.
- *Policy Processes (1,5EC)* is about the analysis of how to come to a political decision. The lecturer and the lectures were not so interesting. With learning the slides, the exam was okay.
- *Measurements in Fluid Mechanics (1EC)* consists of 3 practicals on the theory of water and fluid mechanics. The first was an intro practicum and for the other two, a report had to be written. One practicum is an outside practicum at the small river on campus.
- *Python (1EC)* was a starter course on python, which is almost similar to MATLAB. It was nice to learn it.
- *Project Blue Nile (4EC)* is about designing and managing a dam in Ethiopia. All before mentioned courses are involved in this project. Analysis has to be made, a location has to be chosen and the dam has to be designed. A group with 6 first-year students is assigned to you as a project group. Some students will quit and are therefore not that motivated. Collaboration with the first-year students felt like a step back.
- *Introduction to Mathematics Analysis (3EC)* is a master course and the standard replacement for math. It is given all 4 quartiles and can be 2, 3 or 4 EC. The course is about building mathematics from nothing and it is really abstract. It starts with logic and sets and later adding and multiplication etc. The course is not about equations and solving, but about understanding, recognizing and learning by heart. There were some tests and problems, but these were not reliable for the exam. There was also no practice exam. I would not recommend following this course.

### **Time-intensity and comparison to CSE**

The time-intensity is quite similar to our first year. Although all courses are not that hard, it was time-intensive due to the constant exams and deadlines.

## Premaster Applied Physics

### **Overview**

Name: Jurrie Bruggeman

Organizing study: Applied Physics

Module: Premaster master Applied Physics

### **Motivation**

During my bachelor in CSE, I discovered that I liked the courses about mathematics or more fundamental physics, like quantum mechanics, fluid transport or heat and mass transport a bit more than the other courses. I chose the materials science direction in the bachelor, but liked to go a bit deeper into the study matter. Next to that, physics has interested me for quite a long time. That is why I chose to follow a premaster for Applied Physics (AP) during my minor. This way, I could do something I would enjoy, while at the same time trying to discover whether I would like to continue with physics in my master, or stay at CSE. In the end, I chose to switch to AP, which I am currently doing.

### **Courses**

During my premaster, I followed the core courses from all different years of the AP bachelor. Several of these courses have some overlap with CSE, but the general trend is that it is a lot more fundamental, and a lot more mathematical. If you find this interesting, for example, if you would like a bit more depth or answers to the 'but why is that the case?' questions that may arise in some of the CSE courses, this might be a nice selection for you!

Statistical physics: I followed this course with AT in M1. It concerns the background of thermodynamics, as well as some quantum mechanical properties of particles. I enjoyed the course, but it was also somewhat difficult as we weren't that used to long and difficult equations at CSE.

Solid State physics: This course considers crystals and properties like scattering, magnetism and electronical and thermal conductivity. It is a bit like Advanced Materials in M8, but a little more in-depth which led to more understanding in my case, which I liked.

Classical Mechanics: This course deals with things called Lagrangians and Hamiltonians, which basically are a more powerful way of writing Newton's equations. These you can use to solve many problems with springs, pendulums, etc..., as well as planetary motions. I thought the course was interesting if you like these 'puzzles' and want to use some very useful methods of mathematical problem-solving.

Quantum mechanics: This, I think, was one of the most important courses in my premaster. I learned a lot of mathematical tricks and methods of physical thinking during this course. It is quite a bit more mathematical than the CSE quantum course, and definitely more fundamental. It is however also quite counter-intuitive, which takes some time to get used to.

Electricity and magnetism: This is one of the other more 'standard' physics courses. You learn how you can calculate electric and magnetic fields, and use them to describe the behaviour of charges, (electro)magnets and electromagnetic waves. I thought the course was interesting, since these phenomena are important for so many things.

Practical instrumentation: This is a practical course, in which you learn about electrical circuits and components like capacitors, inductors, transistors and op-amps. For me, this was one of the more

difficult ones because this is not very familiar to CSE students. I had to spend quite a lot of time on this course, but in the end, I learned quite some useful skills.

## M9 Applied Physics – Soft and Biological Physics

### Overview

Name: Phu Minh Lu

Organizing study: Applied Physics (AP)

Module: M9 – Soft and Biological Physics

### **Motivation**

I had this minor as my top priority while choosing what to study during M9 because I wanted to further extend my knowledge in Chemistry/Organic Chemistry. At the moment, I have not heard from anyone who wanted to do it or knew about it, so I decided to just give it a shot. Besides, I wanted to do a minor where I can do experiments or conduct research in the field of natural science. Lastly, I want to choose a biology-related minor where I can learn about the cell biology and culturing as a preparation for the future.

### **Overview**

It is called “soft physics” because you are going to work with materials that are deformed thermally or mechanically by a stress that is extremely small (they call it thermal fluctuation that is usually expressed in  $k_B * T$  unit). You will work with people from different study fields, for example Applied Physics and Biomedical technology, and even master students, but together you will be able to make your team function properly. Although sometimes you would come across some chemical reactions, note that this course is mostly about the physics of molecules.

### **Course experiences**

- *Physical Biology (5EC)* In this course, I learned about how the biological system acts and different characterization techniques. I recalled that the content can be divided into three main parts: the thermodynamics of long-chained molecules, fluorescence and cancer cells. Because we have already had basic understandings in thermodynamics, polymer chemistry and quantum (more like photochemistry), I was able to translate it to simpler version with my terminologies. We had practice exercises, and they were pretty closed to the exam. However, I struggled a bit with learning biological processes since I mostly have not heard of these terminologies.
- *Soft and Biological Techniques (5EC)* is the practical course of Physical Biology and Advanced Colloids and Interfaces. Overall, I had insights into some of the most common techniques to study and characterize biosystems or biomaterials. The nice thing about this course was that the knowledge from the lectures was applicable to the practicals (and vice versa). In my year, there were 5 experimental sessions: FRET (Forcster resonance energy transfer), docetaxel on cancer cells, electrowetting, protein unfolding and particle tracking. Since it was related to many studies, I had the chance to go to different labs and buildings of different research groups in this university.
  - FRET: Energy does not transfer by photon, rather than by polar-polar interaction.
  - Docetaxel: The efficiency of using this compound to treat breast and prostate cancers.

- Electrowetting: Electric field can be used to measure the elasticity of gelatine.
  - Protein unfolding: Some molecules can unfold protein by manipulating Van der Waals interaction or breaking covalent bonds.
  - Particle tracking: You can mark molecules with fluorescence and study the diffusion phenomenon in different conditions.
- *Advanced Colloids and Interfaces (5EC)* is an advanced level of the course Colloid Chemistry in module 7. This course is a part of the Master programme (Material track), therefore you, for your future study, cannot sign up for this course again. One of the most important discussion was about the wettability of a material, resulting in contact angle of a droplet on a surface. In the last lessons of the course, we considered the combination of three forces: electric repulsion, polar interaction and Van der Waal interaction to decide whether a system of colloid suspension was stable or not. The registered final grade includes the paper exam and the assignments. There are a total of 7 assignments (1 per week) which you would solve with your groupmates. In my opinion, if you understand the lectures and use programming tools to calculate and plot graphs, you can nail the exercises.

### **Time-intensity and comparison to CSE**

This module is very intensive as I had to invest a lot of work and time, which was comparable to module 7 (Molecules and Materials). I had to finish reports and assignments every week. Once again, I would recommend prospective students to have from basic to good understanding in these following subjects as it would help you a lot: Organic Chemistry, Thermodynamics, Polymer Chemistry, Photochemistry (or Quantum), Colloid Chemistry and Cell Biology.

On the other hand, the staffs/lecturers/teaching assistants were very friendly and mostly came from the TNW department, which you can always see around the Carre 4<sup>th</sup> floor or the Meander. And if you enjoy module 7 in general, I am pretty sure that you will have a good time studying this minor.



## Leren Lesgeven

*This minor is Dutch only.*

### **Overzicht**

Naam: Tiemen Reuvekamp

Q9 --- Leren Lesgeven basismodule / educatieve module (15EC)

Q10 --- Leren Lesgeven vervolgmodule (15EC)

Ik heb de Leren Lesgeven minor gevolgd in het collegejaar van 2022-2023. De minor is vooral bedoeld om erachter te komen of het lesgeven op het middelbare onderwijs bij je past. Er zijn verschillende vakken (natuurkunde, wiskunde, informatica, etc.) mogelijk bij de minor, maar studenten van CSE kunnen alleen les gaan geven in het schoolvak scheikunde. Het is een dubbele minor, wat betekent dat je beide modules bezig bent. Echter is er wel de keuze om alleen de eerste module te volgen (wat dan de 'educatieve module' wordt genoemd) of om na de eerste module te stoppen. Dit is echter alleen mogelijk met een goede reden (bijvoorbeeld dat het duidelijk niet bij je past). Je haalt dan wel de 15 EC's van de basismodule, maar de bevoegdheid is niet meer mogelijk.

De basismodule bestaat uit drie onderdelen:

- Onderwijskunde 1 (5 EC)
- Inleiding vakdidactiek (+intervisie) (5 EC)
- Schoolpracticum 1 (5 EC)

Onderwijskunde 1 is een vak dat je volgt op de UT. Dit vak gaat in op de relaties tussen docent en leerling, ook wel de pedagogiek genoemd. Hier zal je gedurende de basismodule elke week 1 college over volgen en meerdere verslagen over schrijven. Deze colleges zullen altijd op de donderdag zijn en worden gegeven aan alle studenten van Leren Lesgeven (dus ook de studenten van andere schoolvakken). Dit vak wordt door de meeste studenten, waaronder ik, als extreem vermoeiend ervaren. De colleges zijn wel interessant, maar de opdrachten /verslagen zijn redelijk saai en niet al te nuttig (naar mijn mening).

Inleiding vakdidactiek is ook een vak dat je volgt. Dit vaak gaat in op de vakspecifieke onderdelen (in ons geval scheikunde). Je volgt dit vak alleen met de andere studenten van het schoolvak scheikunde. De colleges zijn extreem relevant voor je lessen en de opdrachten sluiten goed aan op de praktijk. Deze colleges gaan bijvoorbeeld over het behandelen van misconcepties, het uitvoeren van een practicum-les of het gebruiken van werkvormen in de les. De meeste studenten, waaronder ik, ervaren inleiding vakdidactiek als heel nuttig. Ook is het fijner om in een kleinere groep te zitten (circa 12 leerlingen). De docenten zijn vakdidactici met jaren ervaring in het onderwijs en weten heel goed waar ze het over hebben. Ook zijn ze heel aanspreekbaar, dus is het heel makkelijk om vragen te stellen. Naast de colleges en de opdrachten omvat inleiding vakdidactiek ook 'intervisie'. Dit zijn gesprekmomenten, waarin je in een kleine vertrouwde groep je ervaringen kan bespreken. Alles wat hier wordt besproken blijft binnen de groep, dus kunnen er ook meer persoonlijke problemen worden besproken.

Ten slotte is er ook nog Schoolpracticum 1. Dit is je stage. Je krijgt een stageschool aangewezen, waar je wekelijks een aantal lessen gaat verzorgen. Dit doe je onder supervisie van een vakcoach

(ook wel stagecoach genoemd), de aangewezen vakdocent die jou begeleidt. Voordat je les gaat geven op school geef je ook nog minilessen aan je medestudenten (van scheikunde) om te kunnen oefenen. Op deze manier word je niet zonder enige voorbereiding voor de klas gegooid.

De basismodule is vooral als oriënterende module bedoeld. In deze module krijg je alvast een voorproefje van hoe het is om docent te zijn en ontdek je of het lesgeven bij je past. Aan het einde van de basismodule krijg een GO/NO GO advies voor de vervolgmodule. De meeste studenten zullen de vervolgmodule ook doen om hun lesbevoegdheid te halen, maar als het lesgeven echt niet bij je past, kan je altijd stoppen na de basismodule.

De vervolgmodule bestaat maar uit twee onderdelen:

- Vakdidactiek 1 (+intervisie) (5 EC)
- Schoolpracticum 2 (10 EC)

Vakdidactiek 1 is een vervolg op inleiding vakdidactiek en geeft verdieping op verschillende onderwerpen. De structuur van de colleges is hetzelfde en er zullen nog steeds opdrachten zijn die je moet maken. Deze opdrachten sluiten alweer heel goed aan op de praktijk. De meeste studenten ervaren de werkdruk van deze opdrachten wel als heel hoog. De hoeveelheid opdrachten in Vakdidactiek 1 is namelijk aanzienlijk veel groter van in inleiding vakdidactiek.

Schoolpracticum 2 is nog steeds je stage. Je geeft in de vervolgmodule simpelweg gewoon meer lessen. De meeste studenten zijn in Schoolpracticum 1 (de basismodule) 2 dagen per week op hun stageschool en in Schoolpracticum 2 (vervolgmodule) 3 dagen per week.

Het zal per student verschillen hoe hoog zij de werkdruk ervaren, maar de meeste studenten vinden dit wel een pittige minor. De lesstof zelf is niet lastig om te begrijpen, maar het toepassen ervan kan best lastig zijn. Ook ben je vaak lang bezig met schrijven van verslagen en voorbereiden van lessen. De hoeveelheid tijd dat je hier aan besteedt ligt bij jezelf en het cijfer dat je wil halen. De manier van werken en denken is bij deze minor wel heel anders dan je gewend bent en dat is iets waar veel studenten (vooral in het begin) over struikelen. Ik vond de werkdruk zelf nog wel te overzien, maar ik wist van veel studenten om mij heen die er redelijk wat moeite mee hadden.

Ik heb de minor zelf met een voldoende afgerond en ben zeer tevreden met mijn keuze. Ik had ervoor gekozen om deze minor te doen, omdat ik erachter wou komen of lesgeven iets voor mij was en dat is precies wat ik heb bereikt. Je zult niet veel inhoudelijke kennis opdoen, maar wel heel veel praktische vaardigheden. Je krijgt een goed beeld van het docentschap en zal (tot een zekere hoogte) ook wat werkervaring opdoen.

Het organisatorische gedeelte van deze minor (vooral die van vakdidactiek) is het beste dat ik tot nu toe in mijn studiejaren heb ervaren. Het studieprogramma (van het schoolvak scheikunde) is zeer goed geregeld sluit allemaal goed aan op elkaar.

Ik kan deze minor aan iedereen aanraden die geïnteresseerd is om te achterhalen of het lesgeven (in het schoolvak scheikunde) bij hun past.

Er zijn wel een aantal belangrijke dingen om rekening mee te houden:

- De inschrijfdeadline van deze minor is eerder dan normaal. Ook zal je een korte motivatiebrief moeten schrijven (dit kost niet al te veel moeite).
- De opleiding heeft een eigen studievereniging: Onwijs. Als je lid wordt van Onwijs krijg je flinke korting op de studieboeken en kan je gratis koffie krijgen in de studiekamer.
- Ik had het al eerder gemeld, maar voor CSE student is het alleen mogelijk om les te geven in het schoolvak scheikunde (dit omvat ook NaSk in de onderbouw).

Veel succes met je minor keuze en als je nog vragen hebt over de Leren Lesgeven minor kan je mij altijd benaderen!

Groeten,

Tiemen