Allgemeine Studienberatung

Infotalk about the bachelor`s programs Engineering Science and Computational Engineering Science

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00:00 Engineering Science and Computational Engineering Science

Studying different components and interfaces of engineering? A conversation about the degree programs Computational Engineering Science and Engineering Science.

Hello and welcome to another info talk by the TU Berlin Academic Advising Service.

00:24 Introduction

Anne:
My name is Anne Ostheimer. Welcome to all our listeners and my two guests today - two students from the Engineering Science degree program and Computational Engineering Science degree program, also known as information technology in mechanical engineering. Both are degree programs whose names don't necessarily reveal much about what exactly they encompass, so we are all eager to hear what our guests will share with us today. Before we start, I'm sure you'd like to know who they are. I invite both of you to briefly introduce yourselves.

Viktoria:
Hello! I'm Viktoria. I'm studying Engineering Science here at Technische Universität Berlin. We often refer to it as PI (in German), because it's too long otherwise. I've studied at Technische Universität Berlin for five years. I'm in my tenth semester. However, I didn't study Engineering Science the whole time. I initially started with something else before gradually moving in this direction. I'm finishing my bachelor's now and am starting to transition to a master's.

Huda:
Hello! I'm Huda. I studied Computational Engineering Science, CES for short. I also worked

for a long time as a course guidance advisor for Mechanical Engineering and Computational Engineering Science and can share about that too.

01:52 How did you choose your degree program?

Anne:
Viktoria has already mentioned that some students don't take a direct path to their degree program. Many of our listeners are likely nearly finished with school or may have already completed their Abitur and are now thinking about which university to attend and how to choose a degree program. I Imagine everyone is interested in hearing how you chose your degree programs and what your individual paths from school to university and your current degree programs looked like. So, please share with us. Viktoria, how was it for you, starting with the end of school until now and your studies in Engineering Science?

Viktoria:
While I was still in school, I already knew that I definitely wanted to study at university. I always really enjoyed math and physics. However, I was uncertain whether I was strong enough in both of those subjects and would excel in that type of degree program. I had a lot of respect for that. Then I learned that Technische Universität Berlin offers a pre-study orientation program called MINTgrün. It allows you to sample different subject areas and take modules as if you were a regular student at the university. You are actually enrolled and can try out all the different areas and learn what things are like at university. That really helped me choose a degree program. I immediately took modules related to mechanical engineering and engineering science. My flat mate at the time was a master's student in Engineering Science, so I learned a bit from him about what you can do with the degree. He was always showing me simulations with a lot of different colorful images that I found really interesting. That allowed me to see the broad range the program covers and everything you can do with it. That made me think it might be the right fit for me so after two semesters in the pre-study orientation program, I started Engineering Science.

Anne:
Wonderful! Huda, what was it like for you? What did your path from school to your degree program look like?

Huda:
Mine was a bit more complicated. I also knew I wanted to study but not what I wanted study. During my Abitur I would change my mind every two weeks. I didn't really know what I should do. At the end of my Abitur, I realized I found math really interesting and that I really enjoyed the economics component of my advanced course in geography, so I decided to make an advising appointment with the Agentur für Arbeit. The woman I spoke with told me about industrial engineering, which at the time was a big trend and still is. I started with

that, especially after realizing I was able to earn really good grades and had the courage to pursue it. After starting with industrial engineering though, I realized that the technical component is quite small and that it would be difficult to really specialize. It didn't feel like a great fit, so I chose to transfer to a different degree program. I still wanted an interdisciplinary focus, especially because I'd like to manage my own team one day and for that it's important to be familiar with various areas and possess the expertise and language from several areas. In the case of Computational Engineering Science these are mechanical engineering and computer science. Together they form mechatronics. I found this super interesting, so I transferred. The percentage of women studying in this degree program is very very low, but I gained confidence when I transferred because I was no longer so afraid of the material. I would definitely recommend the same approach I took. Transferring programs is not a bad thing and it's perfectly okay to give yourself time to identify your aims and make your decision.

06:13 What does CES cover?

Anne:
Huda, you've told us a little about what Computational Engineering Science - that is information technology in mechanical engineering - encompasses and that it includes both mechanical engineering and computer science. Can you paint us a clear picture? Everyone is probably wondering, what the degree program looks like at a closer level. Tell us what characterizes Computational Engineering Science.

Huda:
Unlike mechanical engineers who focus on building and designing, we in computational engineering science are also able to write our own advanced programs. We program our own simulations like mechanical engineers but with more artificial intelligence for example, so we create more intelligent systems. That's essentially the difference between computational engineering science and mechanical engineering. Computational Engineering Science is a very broad discipline. You can think about it like very computer-intensive mechanical engineering which requires a great deal more programming. Technically it's 70 percent mechanical engineering and 30 percent computer science. That's sufficient for the current world.

Anne:
Ok! Can you provide some insight into the different modules? If a student was just starting out and studying Computational Engineering Science, what are the traditional modules they would attend in the first one, two, or three semesters? Those fundamental semesters of a bachelor's program.

Huda:

The basic modules commonly consist of math you need for later modules. You also have mechanics modules as well as the introduction to programming modules. I can share about one such module: We have one module worth 22 credit points, called "Computer-Oriented Mathematics" or CoMa. This is technically a module in the math degree program which students in CES also take. Over the course of two semesters, we learn several different algorithms and different data structures. That's essentially the foundational module for the computer science component of CES. The module is a lot of work, very difficult, and comprehensive. You really have to work on it consistently: regularly do the programming tasks, regularly do the theory. When I think back on my bachelor's studies, it was definitely a very difficult module.

Anne:
Before I ask for more details about the content, I'd like to add something quickly: You just addressed the idea of credit points, and that "Computer-Oriented Mathematics" is a big module with 22 credit points. Just to explain: In each degree program students must complete certain modules. There are compulsory modules you are required to take, compulsory elective modules which allow you to design your own specialization and where you have some free choice, and electives, where you can freely choose. When you complete a module with a module exam, you earn credit points. Those aren't the same as your grade, which you are also given. Generally, you earn a grade for the completed module but also these credit points. The credits points are a form of measurement for workload when studying. A classic six-semester bachelor's program is 180 credit points, for instance. I just wanted to explain that, so everyone knows what we are talking about. That means, that when Huda tells us "Computer-Oriented Mathematics" has 22 credit points, that really is a lot because a standard semester is 30, so you can kind of imagine what that amounts to. Huda, you also told us that in the first semesters particularly and in your case, this module can be a big challenge. This is something we frequently hear in the Academic Advising Service. That is, that the first semesters present a number of greater challenges. What can you tell us about what to expect in the first semesters, also from your experience in Course Guidance? What can students expect?

Huda:
I definitely think that the first semester is above all very comprehensive. The whole university cosmos can appear very complex because it's very unfamiliar. In school everything is kind of pre-determined and at university you have the freedom to make your own decisions about which modules to take. That's a difficult adjustment, so I would recommend really getting to know how university works, meaning: Do I know where I need to go if I have a question? Who can I ask? What do I need to have accomplished by the end of the week to complete my homework on time and pass the module? This means you need a certain amount of time management and self-responsibility. At the time I thought it was really cool

to organize everything myself because I prefer that over someone telling me what I have to do. That's why I found it a big adjustment at first because everything is very complex and you have to get used to it. However, you can always ask questions and I really appreciated that you can ask anyone at the university and get an answer.

Anne:
Huda, one thing we haven't addressed yet is that Computational Engineering Science has an English title. Do I need English language skills and proof thereof to start studying a bachelor's? How does it work?

Huda:
No, you don't need any English language skills. German is completely sufficient. There aren't that many modules in English at Technische Universität Berlin. If you want, you can choose English-language modules for your electives, but the degree program name was simply amended to reflect how it is called at other universities like at RWTH Aachen. Information technology in mechanical engineering means the same thing.

12:53 What does Engineering Science cover?

Anne:
Viktoria, let's move on to you and your degree program, Engineering Science: What does that encompass? What kind of modules do you have in the first, one, two or three semesters?

Viktoria:
In the beginning, our degree program runs fairly parallel with Mechanical Engineering and even CES. We also have our basic subjects like our first math modules which clearly explain what functions are and how to use and understand them so that we can easily learn all the calculation rules we will need later. For this reason, I personally find the introductory math courses in the beginning particularly important. Everyone is coming from school with a different level of knowledge and this brings everyone up to speed. We also have mechanics modules which form a significant component of our studies. We are required to take mechanics for three semesters for a considerable number of credit points. It's a significant part of the first few semesters. In the beginning of these mechanics modules, we are together with the mechanical engineering students and I think the CES students also have a module with us. But then the students in Engineering Science start to go their own way, because the third mechanics module isn't required by every degree program. That's one difference between us and Mechanical Engineering or CES. We have more physics and math than computer science. We can pursue that as an elective, we have quite a few of those. In the end though, we try to remove the building component of mechanical engineering and focus more on the physics and math.

Anne:
Got it! You addressed the similarities with other degree programs such as Mechanical Engineering and Computational Engineering Science using mechanics as an example. Let's dive a bit deeper into this mechanics module. What exactly do you do in it? What does it mean to take a module? What does it encompass? How would you explain it to someone who has just graduated from school and has no idea how it all works?

Viktoria:
I would start with a different module which is more similar to what you experience in school. In the math modules, for instance, you have a weekly homework. This means you are somewhat obligated to do work for the module and keep up with things during the semester. That's not the case in the mechanics modules. Those don't require homework. Instead, you attend a lecture. In the first mechanics module, you have two lectures each week which are 90 minutes and then a practical tutorial. The lecture is structured so that the professor stands in the front and essentially reads from the book, solves the examples, and teaches the theoretical principles. In my case, I didn't always understand everything during the lectures, so I frequently left with more questions than I arrived with. I benefitted more from the practical tutorial, where the instructor demonstrates how to solve problems that may be included in the exam or homework. That made things a bit more applicable. It helped me understand what I needed certain formulas for, why I was learning certain basic principles and what that all allowed me to do. Let me give an example. Mechanics I, the first mechanics module, deals with statics and elementary strength theory. We look at what it means when a system is statically determined and how to calculate bearing reactions - these are all fundamentals you will need later. In addition to the lecture and practical tutorial, there is also a tutorial. I think the tutorial is the most important thing in the entire degree program because that's where actual students present to other students. Students solve problems together and review questions. It's a relaxed atmosphere because we all know it's just another student standing in front of us and not a professor who you may be somewhat afraid of and don't have the courage to ask questions. That's why this tutorial was a bit like a safe space once a week. There were several different tutors, meaning you could pick which teaching style best fit you, where you understand the most rather than not understanding something because the teaching methods weren't a good fit. That's why this tutorial was the most important part of the modules.

Anne:
Thank you for that. That is exactly how many basic modules are designed, with a lecture, a practical tutorial, and tutorial. Viktoria, you've already addressed that Engineering Science, particularly compared to Mechanical Engineering, goes in a different direction. Mechanical Engineering is another degree program requiring a lot of basic principles and which has a

significant compulsory component, so that students generally first specialize in their master's studies. How is it in the bachelor's, Viktoria? What are the different specializations you can pursue in Engineering Science?

Viktoria:
We have six different specializations in Engineering Science. It's a very broad range to choose from. I decided to specialize in Fluid Mechanics. However, that kind of happened by chance. I was interested in it, and I took several courses in that specialization for one semester and just kind of landed in it. I have a lot of friends though who chose all different specializations. You are still part of the Engineering Science community, even if it spreads out a bit. One thing worth mentioning is that we really go into further detail and get more into the theory. Students in Mechanical Engineering frequently have design projects or are a bit more application oriented. We tend to focus more on simulating or delving into the theoretical background. For instance, another specialization is Numerics and Simulation. Math students would say it's not really math but here you really focus on simulation properties and how to write simulations and evaluate and assess them to determine what we can do with the results. The third specialization is Solid Mechanics. The basic mechanics modules provide a good foundation for this. If you enjoyed those modules in the first semesters, then solid mechanics might be a good fit. There you might work on oscillations or even have a bit of mechatronics. Frequently we look at stick-slip phenomena, meaning what happens at the contact points between different materials. So even within the specializations, you can have different focuses. The specializations I am less familiar with are Thermodynamics, Technical Acoustics, and Mechatronics. Mechatronics is a bit more similar to CES. You work more closely with computer science and electrical engineering beyond the initial fundamentals we learn in the beginning. Thermodynamics attempts to understand processes. If I'm honest, I didn't enjoy that at all. And Technical Acoustics is somewhat related to Fluid Mechanics. In a way, all the specializations are related to one another, and you see the same students in different modules.

Anne:
Given all the different options you have, what is the proportion of compulsory modules and compulsory elective modules in Engineering Science? How much freedom do you have?

Viktoria:
I think we have a lot of different electives in our degree program. We have a compulsory elective component which isn't so big. I think it's ten or eleven credit points which is generally two modules, but we can pick from a relatively long list. That means that even there we have the ability to say “I'm not interested in this subject anymore” or maybe “I'm not doing so well or don't really like the professor.” So you always have the possibility to choose something else. You have even more freedom in the specializations. You have

roughly 24 credit points or four modules which you take. That goes by much more quickly than you'd first expect. You fill those credit points fairly quickly. Here too there is also a long list of options. For example, if you are specializing in Fluid Mechanics, you don't necessarily have to decide if you only want to learn theory or take a more practical approach. Instead, you can combine both however best suits you. That's also one of the reasons I chose this degree program, because everything wasn't pre-determined and I could choose more of my own modules and see which subject areas actually interest me as well as think outside of the box.

Anne:
Huda, let's come back to you and Computational Engineering Science: What's it like for you? What different focuses can you choose from? How much freedom do you have in the program?

Huda:
There are three specializations in CES: Design and Manufacturing, Process Systems Engineering, and Mechatronics. The module groups are structured very differently. Design and Manufacturing has three sub-sections focusing on production and products, such as automotive manufacturing or even air transport, but still focusing on products. Process Systems Engineering focuses on regulating, understanding, and optimizing thermodynamic or chemical processes. This covers material similar to that in Faculty III Process Sciences. The third area is Mechatronics and that's sort of a mix of electrical engineering, computer science, and mechanical engineering. The specialization is primarily there to allow students to put the theoretical knowledge they've learned into practice. You could have practical projects where you learn to program a small car with Arduino, something you may have covered in the theory component. You may have also programmed some smaller programs but not using a product. That's why the specializations are so valuable when you know what you want to do. If you don't know what to pick, give yourself time and take modules from all different areas. Use these to decide which direction you want to go in.

Anne:
Can you share about a project from your bachelor's studies that has stuck with you? Something you particularly enjoyed or that was important to you.

Huda:
Even though I haven't spoken fondly about computer-oriented mathematics, we did have one project at the end I found really great. We programmed a game and instead of thinking about just how to program it, we used game theory and considered what you need to do to win. Then we programmed an artificial intelligence and had three different levels: either you play against another person, play against the AI, or two AIs play against each other. That was

just really cool because I was able to implement the theory I had learned or the material I learned piece by piece in our programming homework into a larger more comprehensive project. We had several projects throughout but that's definitely a project from my bachelor's that has most stuck with me.

25:55 What did you write your bachelor's theses on?

Anne:
If you feel like sharing, what direction did your bachelor's thesis take?

Huda:
I wrote my bachelor's thesis on cars because cars are my passion. I'm very environmentally conscious so I would like to go into the research and development of alternative drives. I chose to write about fuel cell cars. Before writing my bachelor's thesis I completed a research stay at Osaka University in Japan, where fuel cell cars are ready for mass production and are on the market, primarily as a result of efforts by Toyota. It was really interesting to conduct research there and apply what I learned to my bachelor's thesis. I analyzed which pollutants come together in the production of hydrogen in the drive over the entire life cycle. That was my bachelor's thesis.

Anne:
Viktoria, you are also finishing your bachelor's studies. Have you already started writing your bachelor's thesis?

Viktoria:
I actually submitted it about three weeks ago, finally.

Anne:
Wonderful! Congratulations!

Viktoria:
Thank you! Sure, I can talk a little about my bachelor's thesis. The whole thing was a bit complicated because I spent the previous semester doing an internship in Duisburg. The company offered to let my write my thesis there and I considered it, but I wasn't really doing much with fluid mechanics there. I really wanted to explore my specialization more. I decided not to write my bachelor's thesis there and returned to TU Berlin where I found a bachelor's thesis project at the Institute of Fluid Mechanics with a supervisor I knew from a previous module. In the end my thesis was actually more about mechanics and simulation than fluid mechanics. I think it's a good example of how comprehensive this degree program is and that we are always bouncing back and forth a bit from the specializations and can discover what we enjoy. I wrote about a wind turbine at the university. We have a small

research wind turbine...well "small" might not be the right word. The tower is two meters high and the rotor diameter about three meters. It's located in the institute's wind tunnel, our test center so to speak, where we can turn on wind and run tests with the turbine. A model is needed for this wind turbine so that numerical calculations can be made with it, i.e. simulations can be carried out. It's quite practical because such test set-ups are always a lot of effort with all the screws, cables, and measurement technology to be installed. And then you have the time you need to spend in the wind tunnel to collect measurements. And then something doesn't work. So it's always quite practical to have a twin from an experimental setup which allows you to run simulations. I was responsible for creating this twin, which we did using the structural properties of the wind turbine. That means I look at the turbine's natural frequencies and modes. When it moved, I looked at the direction it moved in, how it moved, with what kind of frequencies, and then I tried to reflect that in a numerical model so that the model could be used for simulations.

29:45 What options are open to you after completing the bachelor's degree?

Anne:
You've both talked about your bachelor's theses. That means, mentally, we've made it to the end of your bachelor's studies. Could you share with us a bit about what comes after? In engineering, especially, the classic route is to pursue a master's directly after the bachelor's. What kind of options are open to you after completing a bachelor's? What kind of master's programs could you go into?

Viktoria:
I think traditionally, students do the master's in Engineering Science here at Technische Universität Berlin. However, a surprising number of people transfer to Aeronautics and Astronautics because we have learned all the fundamentals in fluid mechanics and there isn't a corresponding bachelor's for aeronautics and astronautics. As a result, that's a frequent direction Engineering Science students take. Generally, I would say that many of the bachelor's graduates from Engineering Science also do a master's. It's not really the type of degree program where you are done with university after the bachelor's. Instead, many students stay at university and do at least a master's. In terms of disciplines, I'd say we cover a wide range. I realized that when doing my internship. It wasn't in the field of fluid mechanics, but I could still acquire knowledge. In short, I wouldn't say that we are limited in what we can study or which specializations and interests we can pursue but rather that we are able to later work in a wide range of engineering fields.

Anne:
I'd like to jump in here briefly. Viktoria, you mentioned that there isn't really a corresponding bachelor's program for the master's in Aeronautics and Astronautics. Aeronautics and astronautics is situated in the Transportation Engineering degree program which offers

specializations in aeronautics and astronautics, naval architecture and ocean engineering as well as planning and operations. So that would be the traditional route to take to the master's in Aeronautics and Astronautics Of course, it is interesting to hear that there isn't just one path leading to one specific master's program. As such, like Viktoria shared, it is possible to go from Engineering Science to Aeronautics and Astronautics. Huda, let's come back to you: Tell us what it is like in Computational Engineering Science. What are your options after the bachelor's? What different directions can students take and what did you decide?

Huda:
You do have the option to stop studying after the bachelor's but that wasn't an option for me because I enjoyed studying and wanted to do a master's anyways. When you talk to other students, you often hear, "Oh the bachelor's is so stressful and the master's is a lot of fun," because you can choose what you want to do. You have a lot more electives. That's why I also chose to do a master's. The consecutive master's is Computational Engineering Science, just like the bachelor's. Of course, you can pick a different degree program like Mechanical Engineering or Production Engineering. I personally think that if you already chose Computational Engineering Science for your bachelor's and already have the computer science background that it makes sense to continue with CES because you can further your programming skills in projects that are a bit more enjoyable. You can be more creative and see the overall result, unlike in the bachelor's where you just do one part to learn how it's done. That's why I chose to do the master's and picked the same specialization: Design and Production. I also could have picked Mechatronics. However, right at the beginning of the master's program I realized that I could learn a lot more about automobile manufacture in the Design and Production modules. That was important to me because I always wanted to learn more in this field so that I could also work in it later. That's one of the reasons I wrote my master's thesis abroad. I really wanted to return to Japan after my first stay abroad and I wanted to spend time in a company to see how things really are there. I killed two birds with one stone and managed to do both my internship and master's thesis at a German company in Tokyo. I worked at Bosch and really found the perfect niche. For the first time I was able to explore automotive cyber security. In my thesis I explored how to ensure cars aren't hacked. Cars increasingly have a significant amount of software and as a result it's also becoming easier to hack into them. When you look at the statistics, it's evident that an increasing number of cars are targeted in hacks, so I wanted to explore this with my master's thesis. I developed an intrusion detection system to determine which messages in the controller area network - the communication network of the car - are real, such as sensor messages, and which are hacked. That was a really nice experience at the end of my studies.

Anne:
Very interesting work! It's a good example that allows you to understand how mechanical engineering and computer science come together in Computational Engineering Science.

36:12 What did you experience during your semesters abroad?

Anne:
Huda, you said that you went abroad twice, if I'm not mistaken, once during your bachelor's and once during your master's. Tell us a bit about how that works. Where did you get the idea to go abroad? How did it work for you?

Huda:
Well, first of all I knew I wanted to go abroad. I wanted to take advantage of the option. Everyone always talks about how great studying abroad is, so I wanted to try it for myself. I also wanted to go to a country where it wouldn't necessarily be easy for me. Japan was ideal because not very many people speak English there. That meant I needed to learn the language. First, I applied via Student Mobility in the International Office [speaker refers to Akademisches Auslandsamt, which has been renamed] and was one of the lucky ones to be accepted. I thought it was great to have that opportunity. I was able to choose how long I wanted to stay, so instead of a six-month stay I chose to stay twelve and thought it was great. I didn't just take modules and study. I also participated in the Frontier Lab Program at Osaka University. It's like a research stay. At Technische Universität Berlin or rather in Germany in general, it is very difficult to find work in a lab and gain research experience while studying. This is something research associates or similar can do but not students. However, it's completely different in Japan. There it is normal that between the final year of the bachelor's - they study for four years - and the end of the master's, students work in a lab and regularly conduct research including on their own projects. I found that super interesting because it's just not possible to work in a lab here in Germany. After I was there, I independently applied for an internship. That wasn't through the university though. I did it separately by myself.

Anne:
That shows how diverse the possibilities are, even within the scope of going abroad: to study, for an internship, or for a final thesis. Viktoria, how about you? Did you ever go abroad?

Viktoria:
Yes, I did. I also applied to a partner university in Italy via TU Berlin. I stayed in Europe and was only abroad for one semester. For me it was more important that I end up in a country where I speak the language or at least am motivated to learn the language. Italy was a good option because I had French and Portuguese in school and figured Italian couldn't be that

hard. I picked Bologna. It's a beautiful university city. I can only recommend going there to everyone. It's kind of the opposite of Berlin, because Berlin is a very big city and very diverse too. However, I feel like student life is a bit hidden even though many many young people live here. We don't have a campus with everyone living nearby, but rather across the city. Bologna is smaller. There's a city wall surrounding the city. Within that is the city center where everyone meets and goes out for a drink or bite to eat in the evening or to do work for university. Everything is a bit more central which I really enjoyed for six months. I started learning some Italian before I left. I took a language course here at the university. That's also an option, actually, to take the language course as an elective. Then I went to Italy. If I'm honest I didn't speak much Italian, but I did take an entire mechanics course in Italian. In the beginning I was exhausted and a little in over my head because I had to think about what the professor was saying the whole time due to the language barrier, but then I quickly discovered that my Italian drastically improved and I was able to follow along during lectures quite well. That was really great because I not only learned material from my courses but also gained these language skills. Additionally, Italy is wonderful country. It was easy to travel around and visit my Erasmus friends in different places and get to know the country. I also had the advantage of only having class Tuesdays and Wednesdays. That meant I could spend the rest of the week traveling or entertaining guests from Germany and doing things with them. That's definitely an experience I'm glad I had and that I want to do again during my master's, maybe even for a whole year and somewhere else. I'm not sure yet, but I'm definitely planning on going abroad again.

Anne:
So we've now discussed going abroad, internships abroad, and study abroad.

41:30 Which internships did you complete while studying?

Anne:
I'd like to further explore the topic of practical experiences and internships in general. Some degree programs require an internship. What was it like for you? Viktoria, does Engineering Science require students to complete an internship?

Viktoria:
We actually have to complete two internships in the program. The first is a pre-internship. Ideally, students do this before starting their studies but most end up completing the internship during their studies. We spend six weeks in a company learning more of the hands-on tasks, like working with a milling machine, lathe, or files, learning about different materials, and completing tasks. To be honest, I didn't really enjoy the internship because I knew I wasn't interested in that kind of work. I'm not very good with my hands which is why I chose Engineering Science and not Mechanical Engineering. I much preferred my second internship. Usually, you do that at the end of your bachelor's studies in the second to last or

last semester. There you work in an engineering office and do the same work you intend to do after graduating. Normally, that's three months. You also earn credit points for it. It's part of the degree schedule which tells you what you have to complete and when for the degree. I did my internship in Duisburg. It might seem a bit odd to move from Berlin to Duisburg, but I really enjoyed my time in the company there. It was a very small company. That allowed me to have a lot of contact with my colleagues and directly with my supervisor. As a result, I could work on communication and familiarize myself with the different areas of work since each of my colleagues worked in a different field. Our offices were right next to each other, and I could easily go from one office to the next and do different tasks. That led to me staying a bit longer, for five months total. I was able to get detailed insight into what everyday work in my profession would later look like. It also helped me decide which direction to pursue in my master's and know what to expect after graduating.

Anne:
Huda, what was it like for you? Does Computational Engineering Science also include a mandatory internship and what did you do?

Huda:
Yes, we also have two internships, a pre-internship and a professional internship. It's the exact same as Viktoria shared. The pre-internship is intended to introduce students to work in crafts and trades. Even though we don't do this type of work later on, we manage personnel who do, so I learned that it's quite practical if you understand, for instance, how long it takes to mill a machine or what that even is. It's quite useful to know how that all works. It's only six weeks, like for Engineering Science, because it's just a taster course. The actual internship takes place during your studies, generally after choosing your specialization when you have a better idea of what you would like to do. My internship served as a sort of confirmation. I completed my internship at the Physikalisch-technische Bundesanstalt in Adlershof. Even though it had to do with physics it was super interesting because as an engineer I was responsible for the simulations and programming. After I while I understood the basic principles of physics and could contribute my engineering know-how. That was a good way to learn that engineers can adapt to all situations. That was definitely a lightbulb moment for me.

45:33 What's the mood like in your degree programs?

Anne:
Since we are talking about your personal experiences, can you share what the mood was like during your studies? Specifically in your degree programs, what campus life was like and your ability to connect with other students? Huda, what was your experience?

Huda:

It's very very easy to form groups and meet other students that way. But you do notice, particularly at the start of your studies, that you frequently see the same people. Over the course of your studies, especially in the master's program, you see the same faces as always. It's a bit funny. During the coronavirus pandemic, we didn't really see each other in the lecture hall but instead when we were asking questions or something. I really enjoyed seeing people I knew I had taken modules with but had never met in person. Generally, you are always working with other people. Right from the start, you are trained to work in teams or groups to practice teamwork. This is really important because later on you are nearly always working as part of a team. You have to coordinate with each other, trust one another and trust that the others will do their part correctly. You spend a lot of time together in the period before submitting a project and give each other advice. I thought that was really nice and kind of embodied the spirit of engineering, where we are all helping each other. Instead of keeping each other at a distance, we helped each other, and that kind of spirit is what I think is great about engineering.

Anne:
Viktoria, what was your experience? What's the mood like among the Engineering Science students, theory aside?

Viktoria:
I have to say, I didn't have much to do with study groups the first two semesters. Instead, I was studying for exams by myself. Later though, I formed study groups and that was the best time of all. I remember sitting in a classroom together during the exam period, working on our exercises and asking each other questions. We always helped each other. I think there are other degree programs where students compete with one another, but that wasn't the case with us. We helped each other, answered questions, and motivated each other to keep pushing on. I think that's a really great characteristic in our degree program and helped me a lot personally. With exam preparation, yes, but also with settling into the university and learning it's never wrong to ask questions. I repeatedly found myself in situations where I was able to help someone and then two days later needed help from the same person. We supported each other throughout the course of our studies.

48:41 What challenges did you face?

Anne:
You both spoke about the importance of working in groups, asking questions, and helping each other out. In retrospect, what are some challenges you faced during your studies and how did you overcome them? What strategies did you use? Viktoria, would you like to start? What was it like in Engineering Science?

Viktoria:

I think I had one problem, but it is kind of related to the pandemic. What I noticed - and this is something Huda has already mentioned - is that you see a lot of people in the beginning and take modules together. Later you kind of split up and you frequently still see people you might not know so well. However, in my recent online seminar, I sometimes had difficulty connecting with others, forming study groups, or even simply asking someone a question, because it's less personal than it was on campus. I had a lot of issues as a result until I looked to see if anyone I knew at all was in the modules with me. I would write to that person, even if I didn't know them that well but had met them in passing, and drew up the courage to ask, "Hey, do you want to be in a study group together?" In the end, we are all in the same situation. It's strange for all of us and we have to figure out a way to meet new people. In my modules last semester and this semester, I had people who would just put me in touch with their friends and that allowed me to meet new people and make new relationships, further motivating me in the module.

Anne:
Huda, what was your experience? Did you have any type of barrier during your Computational Engineering Science studies that initially took you by surprise and you found difficult? Can you think of anything?

Huda:
I never really had the courage to ask questions, especially during lectures or practical tutorials because I always thought, "Ok, I didn't prepare enough, and I don't want to make it look like I'm not capable." However, over time I learned that it is important to ask the right questions. This was really the case during my time at Bosch. It's not that I was always asking the right questions, but I was so curious and wanted to know more, I created this sort of image for myself as the person who was always asking interesting questions. Asking questions is important and it doesn't reflect anything about me except my interest. I've learned that it's better to ask a question and discover that someone else had the same question or didn't know how to phrase it or maybe hadn't even thought of that particular detail. That was definitely one lesson I learned. The other lesson is related to that. At the beginning of the semester, I didn't attend office hours. I felt that I didn't need it or it wasn't so urgent at the start of the lecture period. As a result, I didn't ask any or very many questions and was lost when exams came around. I needed to start asking questions earlier and be curious regardless of what others might think of me.

Viktoria:
I would like to add to that. I had a similar experience. In the beginning, I thought if I didn't understand something during the lectures, it was because I wasn't smart enough to understand it and everyone else was. Until eventually I realized that maybe others also hadn't understood the material. During lectures I would always turn to the people around

me and ask if they had understood what the professor had just said, and frequently they would reply "No, I stopped understanding them five minutes ago." So it's important that you have the courage to ask questions. In the end, you are never the only person in the lecture hall or tutorial with this question. Maybe the others also don't have the courage or have figured out how to ask it like you have.

53:34 What questions can Course Guidance help with?

Anne:
You've both addressed an important issue. This is something we also frequently encounter in the Academic Advising Service. Many students are timid and during the first semester think, "Oh gosh, I feel like I'm the only one who doesn't understand mechanics or linear algebra and everyone else seems to understand it perfectly well," and as a result they create all this unnecessary pressure on themselves and are afraid to seek help. This is definitely something everyone should note for their future studies: Find help and ask questions. This is a good opportunity to mention all the different offices like Course Guidance. As I've mentioned, there's the Academic Advising Service. You can also contact them if you have general questions about studying, are having doubts about your studies, or anything like that. Then, there's Course Guidance, which Huda will tell us more about, as she was an advisor there. Huda, could you give us a short overview of the types of issues students go to Course Guidance with and how it can help?

Huda:
Students can ask Course Guidance all sorts of questions, because we are there to take care of students and if we don't know the answer we will point you in the right direction. We make it as easy possible. You can come to us at any point of your studies and ask us a question. Generally, we get questions about the study and examination regulations which lay out the framework of students' studies. Things like how long I have to submit a sick note for an exam or enrollment deadlines. Rules that are important to observe to make sure you can keep studying. Apart from that, we also get a lot of subject-specific questions, such as about which modules can be combined with each other. Students also frequently come at the start or end of the semester and ask us how to plan the next semester. I think it's good because you can come and show us your plans and ask if they are okay the way they are and find out if someone else managed the same thing. Sometimes students come to us and tell us how they are going to take certain modules at the same time and it's just suicide because it's much too much and much more work than the credit points. Or some modules are easier and less work than indicated by the credit points. It's quite practical to come to us because we've done it ourselves and know which modules are rough and a lot of work even if they don't appear that way. That ensures they have a successful semester. That is our primary objective. Students can also come to us when they aren't sure how to plan the rest of their

studies or the next semester or which specialization to choose. The primary purpose of Course Guidance is to help. We want students to leave satisfied and happy.

Anne:
Let's say I just graduated school, I'm a prospective student, and I have detailed questions about the content of the Computational Engineering Science program, could I go to Course Guidance?

Huda:
Absolutely. Even if you don't know if you want to study Mechanical Engineering or Computational Engineering Science or Engineering Science, you are welcome to come by and we will share our experiences with you. For the most part, trying things out is very important. However, we can make your start to this a bit easier through our experiences of the different areas, how the degree programs and specializations differ from one another, etc.

58:02 What are your career prospects after graduation?

Anne:
Let's turn our attention to the future. If you already have a rough idea, can you tell us about your plans after your studies or possibly what traditional careers graduates pursue? You don't have to know exactly what you are going do and this is something everyone should be aware of. There are so many different paths you can take after studying. But maybe you can give us an idea of what students frequently choose to do or where you are headed next. Viktoria, what's it like in Engineering Science? Where do graduates from your degree program generally end up?

Viktoria:
It's a mixed bag, really. I think very few of us work in building and instead work more with simulations or theory or experiments. For example, what I did in my internship. I wrote a program which determined the geometry of a body and then I simulated this body and looked to see how it behaves mechanically under stress. I think that's a realistic career path. However, I personally think I would like to stay at university. I'm transitioning to a master's now and I can very easily imagine continuing to work at the university afterwards because I'd like to combine research and teaching. I could give lectures or exercises and contribute a research perspective at the same time.

Anne:
Huda, what are your plans? Or what do graduates from Computational Engineering Science go on to do? What are the options?

Huda:
There are a lot of different options. We can really work anywhere. If you are interested in industry, then you can do that and learn further there. You never stop learning. Even once you have your degree, you are always learning something new. So you can either go into industry, or as Viktoria mentioned, stay at university and do a doctoral degree. I personally would like to go into research, preferably applied research. I really enjoyed being able to research cyber security for my master's thesis and working on something myself, but my goal is for my work to have an impact on automotive manufacturers. There are very many new security standards which previously didn't exist and have developed as a result of all the hacking incidents. So I think it would be really great if my work contributed to making cars safer and not just test cars but cars in series production. For that reason, I'd really like to go into industry or project-based university research.

1:01:17 What advice would you like to give prospective students?

Anne:
You've both elaborated on several interesting aspects and options after studying. We are nearing the end of our info talk. If you had to reflect and think back on what you wish someone had told you before you started studying, what would it be? Viktoria, how about you?

Viktoria:
At the beginning of our conversation I spoke a bit about the pre-study orientation program and how I was a bit nervous to start this program after finishing school. I would say to anyone: Just do it, try it out. In the end we have all been in the same place. We finished school and thought, "Okay, what now?" Even if someone tells you a degree program is difficult or something: If you are actually interested in it and stay on the ball and will work hard for it, then it's feasible. You shouldn't shy away from it just because someone says the degree program is supposed to be hard. I always say hard is relative. Some students are better at math and physics, others are better at the more artistic subjects. I would advise prospective students to take the time and do this pre-study orientation program or something similar, and not be as afraid as I was in the beginning.

Anne:
Huda, what about you? Do you have a tip?

Huda:
I agree with Viktoria. There's nothing wrong with trying something out and even realizing, "No, it's not for me." There are so many options. You don't have to finish studying in record time. It's more important that you grow and develop as a person. My focus during my studies was to learn at every opportunity and I took extra time so I could learn more. In

retrospect, I would say you never stop learning, so you really don't have to worry. You will always learn something new, as long as you make sure that you are challenging yourself to develop skills, like programming, or analytical skills like problem-solving so that you can always solve a problem and can find your way through any physics or technical problems. In sum: Everything will be fine as long as you aren't afraid to just do it.

Viktoria:
I think something related to this is also not being afraid to transfer degree programs. If you started a degree program - like you did Huda and I know a few other people who said, "No, I've already been studying this for four or five semesters. I don't want to transfer. I'm already so far." Then I would say: Have the courage to transfer. If it's not the right fit, then take some time to orient yourself and find something new. I think it's extremely important that you are passionate about what you are doing, especially when studying and can say "I've found my niche, and this is actually what I would like to do."

Huda:
Exactly! It's better to transfer programs and take the time now than later when you are working. Studying and spending time now to learn something new is relatively cheap compared to later in your professional life. There you have to pursue continuing education outside of work and it takes ages. So I would absolutely agree with you. Changing your mind while studying is really really good and not at all a bad thing.

1:05:06 Final words and contact

Anne:
That's a great note to end on. Thank you so much, Huda and Viktoria, for taking the time to give us a glimpse into your degree programs, Engineering Science and Computational Engineering Science. We are nearing the end of the episode. Thank you also to our listeners for tuning in. If you found this info talk interesting, I invite you to also listen to the one on Mechanical Engineering and Transportation Engineering. Those are the other two degree programs offered by Faculty V, the Faculty of Mechanical Engineering and Transport Engineering here at Technische Universität Berlin. If you have detailed questions about the degree programs, don't be afraid to ask for help and contact Course Guidance. Or contact the Academic Advising Service if you have general questions about studying or are unsure which degree program could be right for you. We offer digital open office hours, where you can drop by. Further details about how to contact us can be found below this video. We are also happy to advise via email and hope to see you soon at Technische Universität Berlin or in our advising sessions. Take a look at our website StudienberatungAtHome. You'll find this info talk there and much much more. It includes information about events, like our different info sessions and the other info talks from this series, not just about the study programs in Faculty V. We also have an information video about the MINTgrün pre-study orientation

program. That's the program Viktoria attended. If you want to learn more, watch that video. So, that brings us to the end. Thank you, Viktoria, Huda. I really enjoyed speaking with you and wish you all the best in your future endeavors. And thank you for taking the time today.

Huda:
Thanks for moderating.

Viktoria:
Yes, thank you.

Huda:
- Bye!

Viktoria:
- Bye!