CHEMICAL ENGINEERING AND BIOTECHNOLOGY

3-YEAR BACHELOR’S PROGRAMME · 2-YEAR MASTER’S PROGRAMMES
Would you like to discover new materials for medical uses or manufacture cheaper solar cells for electricity production? Are you interested in developing catalysts to reduce air pollution or secure clean drinking water and protect the environment? Or maybe you are intrigued by the development of nanomaterials?

Chemical and biotechnological processes are significant factors in today’s modern and technological society. As a Chemical Engineer, you will take part in the technological developments for the future. You will learn how to design, control, and regulate chemical processes, and you will be able to use your knowledge to impact the world we live in. You will study issues within analysis, production, and control regarding environment, energy, food safety, and development of new materials.

In close collaboration with industrial partners, you will solve real life issues, and you will learn how to apply academic knowledge in a creative and experimental way in order to study different potentially brilliant solutions.
BACHELOR’S PROGRAMME IN CHEMICAL ENGINEERING AND BIOTECHNOLOGY

As a student at the Bachelor’s programme in Chemical Engineering and Biotechnology, you will work with applied chemistry. You will not just work with theoretical calculations and model simulation, but real life problems! In all aspects of the programme, the focus is on converting theoretical knowledge into useful applications for problem solving. The study programme consists of a mixture of specific subject-oriented courses and team-based projects, where you strive to solve real life chemical engineering problems in cooperation with your fellow students – and often with industrial partners as well.

During your education, you will find answers to questions such as:

- What are the mechanisms in coating self-cleaning surfaces with nanoparticles?
- How do we remediate contaminated groundwater and convert it to drinking water?
- What difference does biogas make?
- How can we produce cheap solar cells?

FIRST YEAR

During the first year, you will establish basic knowledge within chemical engineering and biotechnology. You will also develop general engineering skills in math and contextual subjects and learn how to work and navigate as a modern engineer in larger team projects. In the two projects carried out within the first year, focus is on relevant chemical products in our society and the production process. The first year is structured in the following way:

- Chemical and Bio Industrial Products - 10 ECTS
- Chemistry, Environment and Health – a Case Study - 5 ECTS
- Problem Based Learning in Science, Technology and Society - 5 ECTS
- Organic Chemistry - 5 ECTS
- Linear Algebra - 5 ECTS
- Chemical Reactions in Natural and Technical Systems - 15 ECTS
- Bioactive Molecules - 5 ECTS
- Fundamental Chemical Engineering and Thermodynamics - 5 ECTS
- Calculus - 5 ECTS

SECOND YEAR

During the second year, you will have courses in a series of basic chemical subjects. The themes of the projects will be analytical chemistry, material science, or biochemical processes. The second year is characterised by experiments, and you will develop important laboratory skills, making you an excellent chemical practitioner. The structure of the second year is as follows:

- Chemical Analysis of Homogeneous Systems - 15 ECTS
- Methods in Quantitative Chemical Analysis - 5 ECTS
- Inorganic and Physical Chemistry - 5 ECTS
- Applied Statistics - 5 ECTS
- Polymer Technology / Applied Microbiology / Food Quality - 15 ECTS
- Chemical Thermodynamics and Separation Processes - 5 ECTS
- Biological Chemistry - 5 ECTS
- Material Science and Material Selection - 5 ECTS

THIRD YEAR

During the third year, you will develop your general engineering skills and learn to design, control, and adjust chemical processes and systems. You will learn the importance of process risk and safety analysis as well as scale up principle and much more. You will gain necessary insight into other areas of engineering as well - an insight which is needed for larger projects to succeed, and which can be the foundation for future collaboration. The projects focus on process analysis, basic modelling and design. The third year is structured in the following way:

- Chemical Process Engineering / Bioprocess Engineering / Environmental Chemistry and Remediation - 15 ECTS
- Chemical Reaction Engineering - 5 ECTS
- Fundamental Fluid Mechanics and Heat Transfer - 5 ECTS
- Mathematical Modeling and Numerical Methods - 5 ECTS
- Design of Experiments - 5 ECTS
- Process Control, Instrumentation and Safety - 5 ECTS
- Theory of Science and Entrepreneurship - 5 ECTS
- Bachelor’s project - 15 ECTS

The second project during the third year is your bachelor project. You choose the subject within the framework of chemical engineering.
WITH AN UNDERGRADUATE DEGREE IN CHEMICAL ENGINEERING AND BIOTECHNOLOGY, YOU MAY CHOOSE TO CONTINUE WITH ONE OF THE RELATED MASTER’S PROGRAMMES AT AALBORG UNIVERSITY IN ESBJERG:

- MASTER’S PROGRAMME IN CHEMICAL ENGINEERING
- MASTER’S PROGRAMME IN OIL AND GAS TECHNOLOGY
During this Master of Science in Chemical Engineering, you can both use your creative and technical skills. You will plan and accomplish assignments related to operation and maintenance within chemical and chemically related production.

Chemical Engineers are responsible for many innovative developments and processes that are protecting the environment and securing a better use of resources – it is chemical engineers who will provide future breakthroughs!

Studying Chemical Engineering, you will gain knowledge about the chemical industry. Your creativity will be challenged and trained, and your understanding of complex chemical and biochemical processes will be strengthened. You can immerse in subjects such as:

- Bio Energy
- Environmental Technology
- Polymer Technology
- Ceramics and Photocatalysis
- Spectroscopy and Data Analysis

"I want to contribute to solving the problems in Denmark – that is why this field is so interesting. For example, I can work with developing medicine for the pharmaceutical industry, or I can focus on ensuring clean drinking water. I am not sure which field I will specialise in yet, but I know that I want to make a difference.

During the study programme, we gain insight into the industry, and we get an idea of what we can work with in our future careers. This is significant knowledge when we study theories or work in the laboratories.

Additionally, the group work prepares us for our future jobs as we learn how to work together to find a solution. We have good relationships to the professors, and the teaching is characterised by much more dialogue than I expected".

Hülya Ucar, studying Chemical Engineering
In today’s society, we are still using plenty of oil and gas, and we need Chemical Engineers to obtain it. Well-known oil reserves are constantly being supplemented by new findings. Not because we discover new oil and gas deposits, but because experts can optimise the production in a way that allows for use of even small or abstruse oil fields. As a chemical engineer in Oil and Gas Technology you can contribute to this optimisation.

During this Master of Science in Engineering programme, you obtain a profound insight into the offshore sector – from production of offshore installations to equipment and service to the extraction of oil and gas. Moreover, you gain insight into the development of new biofuel from biomass. We can create biofuel in the laboratories within minutes, whereas the development of oil and gas has evolved over millions of years. In terms of onshore, you will be part of projects for development of geothermal facilities.

Geology, process technology, and safety are significant aspects in the study programme. You can prepare for an international career as candidates from Aalborg University Esbjerg are needed all over the world.

SEMMER OVERVIEW

**First semester:**
- Oil and Gas Separation - 15 ECTS
- Fluid Mechanics - 5 ECTS
- Colloid and Interface Science - 5 ECTS
- Thermodynamics, Separation and Instrumentation - 5 ECTS

**Second semester:**
- Oil and Gas Production - 15 ECTS
- Process Simulation - 5 ECTS
- Water Treatment - 5 ECTS
- Petroleum Geology and Reservoir Engineering - 5 ECTS

**Third semester - Electives - 30 ECTS:**
- Enhanced Oil Recovery
- Evaluation of Petrophysical Parameters of Oil Reservoirs
- Production, Separation and Piping of Oil and Gas
- Ceramics, Sol-gel Processes and Photocatalysis
- Spectroscopy and Data Analysis
- Study abroad
- Long Master’s thesis

**Fourth semester:**
- Master’s thesis - 30 ECTS
I WANT TO WORK OFFSHORE IN EUROPE

“I did my Bachelor studies in Geology in Bulgaria. In my Master’s programme, I have chosen to study Oil and Gas Technology. I want to work offshore in Europe – or more specifically the North Sea. Aalborg University Esbjerg is therefore the obvious choice as it has the knowledge and the expertise necessary for me to reach my goal, even better. Aalborg University is close to industrial partners within this field. This is also where I see myself working afterwards.

There is a good study environment here. The group work is very different from the learning methods I experienced in Bulgaria – but it is very close to the working methods awaiting us in the industry after graduation. Here, the work assignments will also often be carried out in teams. Additionally, the group work forms the basis for creating a sense of community.”

Yanina Ivanova, studying Oil and Gas Technology

OPPORTUNITY TO TRY OUT OUR KNOWLEDGE IN REAL LIFE

“I chose to study at Aalborg University Esbjerg as I wanted to specialise in Oil and Gas Technology. I want to work in the offshore industry for instance as a drill manager or a rig manager.

At Aalborg University Esbjerg, we have the opportunity to try out our knowledge in real life, and there is always a teacher nearby, willing to help and guide us. There is a very informal atmosphere here, which provides the optimal conditions for learning.”

Javier Sanchez, studying Oil and Gas Technology
Graduating from Chemical Engineering or Oil and Gas Technology, you have excellent opportunities of finding work. Your future workplace can be an engineering company or a public institution, where your job tasks can involve for instance:

- Offshore processes
- Development of new materials for the medical industry
- Work environment in the plastics industry
- Drinking water supply
- Development of catalysts for reduction of air pollution
- Production of biofuel
- Consultancy within the offshore and environment industry
- Development of ceramic materials for solar cells
- Teaching and research
- Environmental control and analysis

CAREER OPPORTUNITIES

INTERESTED IN ENVIRONMENTAL ISSUES

“The amazing thing about being a Chemical Engineer is the fact that this line of profession allows me to take action and solve problems. That is what attracted me from the beginning, and it still motivates me. I am very interested in environmental issues, and I am very glad that it is not just my work task to describe the existing problems but also to develop and pursue a solution. In this way, chemical engineering is a very tangible field.

I am very motivated by the problem based and project-oriented way of studying which characterises Aalborg University Esbjerg. It is a great way to learn about chemistry and to understand that challenges, such as protection of the environment or cleansing of ground water, are fundamental chemical issues. When you get a hold of the problem, you learn a lot about it. We often collaborate with industrial partners in the projects, and this contact to “the real world” is very good as it allows us to apply our theoretical knowledge in practice.

Studying at Aalborg University in Esbjerg is very good. It is inexpensive to live here, and the university is a small place where you quickly get to know your fellow students and develop a close relationship to your teachers.

Henrik Tækker Madsen, Master of Science in Engineering, Chemical Engineering, currently a PhD student
PROBLEM BASED LEARNING

As a student at Aalborg University, you will work closely together with your fellow students by way of problem based project work. The Aalborg Model for Problembased Learning (PBL) receives great interest both nationally and internationally, and UNESCO has placed its only Professorial Chair in PBL at Aalborg University.

Typically, you will be part of a group consisting of 4-5 students. Once you have formed a project group, you need to define a problem together that you want to examine. The problem forms the basis of your project, and you are to a great extent responsible for defining it yourselves within an often very broad theme frame. The group work ensures a great variety of approaches and perspectives, which results in a sound and thoroughly prepared project. Together, you are able to discuss the details thoroughly. At the same time, you are able to solve larger and more complex problems than if you were studying on an individual basis.

Each of you has the opportunity to shape the project because group work requires a contribution from everyone. If you have any academic questions, you may also discuss these with your friends in the group. The project work is completed with an exam. While working on your project, you will also need to do individual exams. Together with lectures, literature and cooperation with the corporate sector, the project work will help you gain a deeper insight into the subject you are examining than if you had been working on your own.

With group work, you will quickly realise that you might have different opinions about how to solve a problem. Group work means that you have to compromise, and you will learn a lot about how to cooperate. Group work is very popular in the modern labour market so both you and your future workplace will benefit from the skills in cooperation you have acquired at Aalborg University.

“The study method of projects and group work at Aalborg University is great. We learn how to cooperate with others, and we get relevant input from each other. This is also how it is going to be when we graduate and enter the labour market. The study programme ensures that we are well-prepared for this. At the same time, the study method creates a good study environment not only professionally, but also socially. We have a really good time together.”

Kacper Januchta, studying Chemical Engineering

RATED FOR EXCELLENCE

Aalborg University is rated for excellence in the QS-ranking system. Aalborg University has received five stars, certifying the world-class position of the university based on cutting-edge facilities and internationally renowned research and teaching faculty.

Within Engineering and Technology, Aalborg University ranks as number 79 in the world.
STUDENT LIFE

STUDY IN ESBJERG

Situated by the sea, Esbjerg is a town with more than 70,000 inhabitants. The town is known for wind energy, the oil industry and shipping. As a student at Aalborg University in Esbjerg, AAU Esbjerg, you can enjoy the city’s many opportunities with regard to cultural experiences, sports, and spare time activities. Aalborg University Esbjerg is located only around 3 kilometres from Esbjerg town centre, and transport options are great between the town centre and campus. Therefore, you have easy access to the many cultural experiences and spare time activities that Esbjerg has to offer. Moreover, the environment at Aalborg University Esbjerg is characterised by a strong sense of community and a unique atmosphere, which allows you to quickly get to know your fellow students as well as the staff.

ACCOMMODATION IN ESBJERG

Your chances of finding student accommodation in Esbjerg are very good, and the price level is lower than in most other university cities in Denmark. In recent years, we have succeeded in providing accommodation for all international students, and this we continue to strive for.
PRACTICAL INFORMATION

APPLICATION AND REQUIREMENTS

Admission to the Bachelor’s programme in Chemical Engineering and Biotechnology

To meet the entry requirements for the degree (bachelor) programme you must have:

- An upper secondary school exam
- English B or an acceptable IELTS or TOEFL or Cambridge score
- Mathematics A
- Physics B
- Chemistry B or Biotechnology A

In order to apply for admission, please go to the portal of the Danish Ministry of Education, optagelse.dk.

Admission to the Master’s programmes

If you wish to register for one of the Master’s programmes, you must have a Bachelor’s degree or the equivalent in chemical engineering awarded by a recognised university or institution of higher education. Furthermore, you need to document your English skills.

TUITION-FREE STUDIES

Students from EU/EEA countries are not required to pay a tuition fee. However, all students must pay all other costs related to studying in Denmark: for example costs related to books, living expenses and accommodation.

With the exception of students from partner universities outside the EU/EEA, a student from a non-EU/EEA country will need to pay a tuition fee.

For more information, please see: apply.aau.dk/how-to-apply-postgraduate

DEADLINES

Bachelor’s programme
- Application deadline for all international students applying for a full Bachelor’s programme is 15 March, 12.00 noon.

Master’s programme
- Application deadline for all international students applying for a full Master’s programme is 1 April.

LANGUAGE REQUIREMENTS

The official language requirements when applying for the Bachelor’s programme or the Master’s programmes are:

- IELTS (academic test): 6.5 or
- TOEFL (paper-based): 560 or
- TOEFL (internet-based): 88 or
- Cambridge Certificate of Proficiency (CPE)
- Certificate in Advanced English (CAE)
- Cambridge First Certificate with the grade B

Please refer to apply.aau.dk for further information and application forms.
If you have questions about how to apply or general questions about studying in Denmark and life at Aalborg University Esbjerg, please contact:

INTERNATIONAL OFFICE IN ESBJERG

Aalborg University Esbjerg
Niels Bohrs Vej 8
DK-6700 Esbjerg
Denmark

E-mail: international@esbjerg.aau.dk