APPLIED INDUSTRIAL ELECTRONICS
Welcome

Power electronics, electrical machines, instrumentation, automation and robots play key roles in our society today. With an education in Applied Industrial Electronics in Esbjerg you can help shape the development of these areas.

The Bachelor’s programme in Applied Industrial Electronics equips you to work as an electronic engineer. During the programme, you will learn how power electronic converters and electrical machines function and how they are developed. For example, you can work with underwater robots or on how wind turbines are controlled.

During the programme, you also gain knowledge about embedded systems and about computers and programming, and you learn about signal processing, instrumentation, automation and about mechatronics and robots. In addition to knowledge about how to develop systems, you also learn how to test and validate systems to ensure that they work as intended.

With a Bachelor’s degree in Applied Industrial Electronics you can continue on a MSc programme in Engineering. As an engineer, you can work in the process, automation, and energy industry where you can develop new converters and machines for wind turbines, work with energy and performance optimization of industrial processes or with mechatronic systems such as robots or wave energy systems.

During your study you will work closely with companies throughout your project work. The projects are based on the industry’s current issues and are organized so that you and your project group are constantly challenged to think in innovative, creative and systematic ways in order to find new solutions.

The programme in Applied Industrial Electronics is taught in English and in an international research environment. This means that in addition to your academic competencies, you also develop your language skills. The international environment also provides you with intercultural competences that will serve you well in your future career.
ACADEMIC CONTENT

The Bachelor’s programme in Applied Industrial Electronics is wide ranging within the electronics and power electronics area. In the first semesters, you learn about basic electronic systems, and towards the end of the program you work with more specialized topics such as industrial electronics, robotics and mechatronics.

In each semester, courses constitute half the study time, while the other half has focus on project work carried out by groups – often working closely with research environments and/or companies. Together with your study group, you use theories and methods to solve a problem from the real world. In all semesters, you have the opportunity to do projects with experimental set-ups in laboratories.

During the study programme, activities will be arranged such as field trips to various industrial companies as well as guest lectures with people from the industry who will tell about the development of electronics and power electronics and about the practical systems and projects the companies are working on.

1ST SEMESTER: BASIC ELECTRONIC SYSTEMS

The first semester of the programme is about basic electronic systems, and you learn to work in a problem-oriented manner in both courses and project work. In the courses, you work with calculus and with basic energy systems and electrophysics. In the project work, you use your knowledge from the courses when you do your first project together with your group.

In the project, you can for example examine how a simple electronic system works such as a doorbell or a Lego robot.

Project
• Basic Electronic Systems (15 ECTS credits)

Courses
• Calculus (5 ECTS credits)
• Fundamental Energy System Physics and Topology (5 ECTS Credits)
• Problem Based Learning in Science, Technology and Society (5 ECTS credits)

2ND SEMESTER: MICROPROCESSOR-BASED SYSTEMS

The focus of the second semester is microprocessors. In the courses, you will gain basic knowledge about electronics, programming and linear algebra. In the project, you work with microprocessors and become familiar with the principles of such systems, and learn how to design and programme a system. For example, you can develop an electronically controlled dosing system or control a football robot.

Project
• Microprocessor Based Systems (15 ECTS credits)

Courses
• Introduction to Electrical Engineering (5 ECTS credits)
• Real Time Systems and Programming Language (5 ECTS credits)
• Linear Algebra (5 ECTS credits)

3RD SEMESTER: INSTRUMENTATION

In the third semester of the programme, the topic is instrumentation. In the courses, you work with circuit theory, signal processing and applied engineering mathematics. In the project work, you use the competence you gained from the courses when you examine how battery storage for a solar cell system on building works, or how a dimmer is dimensionally configured.

Project
• Instrumentation (15 ECTS credits)

Courses
• AC Circuit Theory (5 ECTS credits)
• Applied Engineering Mathematics (5 ECTS credits)
• Signal Processing (5ECTS credits)
4TH SEMESTER: CONTROL AND REGULATION

The fourth semester is about control and regulation. In the courses, you are involved with regulation, modeling and simulation and with power electronics. The course content is integrated in the project when you, for example, work with controlling a speed-controlled pump system or a converter for a solar cell system.

Project
- Control and Regulation (15 ECTS credits)

Courses
- Fundamental Control Theory/Basic Regulation (5 ECTS credits)
- Modelling and Simulation (5 ECTS credits)
- Power Electronics (5 ECTS credits)

5TH SEMESTER: AUTOMATION WITH APPLIED POWER ELECTRONICS

In the fifth semester, the focus is on automation. In the courses, you work with digital control, electrical machines and numerical methods. The course content is integrated in the project and you can, for example, work with how to regulate a heat pump for floor heating, how to control a DC motor for a go-cart, or how the generator in a wind turbine can be connected via a power electronic converter.

Project
- Automation with Applied Power Electronics (15 ECTS credits)

Courses
- Modern Digital Control (5 ECTS credits)
- Electrical Machines (5 ECTS credits)
- Numerical Methods (5 ECTS credits)

6TH SEMESTER: POWER ELECTRONICS AND ELECTRICAL MACHINES OR MODELING AND CONTROL OF ROBOTS

The sixth semester is the final semester of the programme. The courses of this semester are related to modeling and control of robots, mechanics, and a course on testing and validation including theories about system understanding and setup. In this semester you write your Bachelor’s project and you can choose between two different BSc project themes:

- Power Electronics and Electrical Machines where you for example can, work with electrical machines in small isolated network systems, look at an active damper for mechanical vibrations on a drilling rig, or look at the development of the generator system for a wave energy system
- Modelling and Control of Robotic Systems. Here you can, for example, work with underwater robots for inspecting cables on the seabed, drone systems for installation or environmental monitoring

Project
- BSc Project: Power Electronics and Electrical Machines or Modelling and Control of Robotic Systems (15 ECTS credits)

Courses
- Mechanics (5 ECTS credits)
- Modelling and Control of Robot Manipulator (5 ECTS credits)
- Test and Validation including System Set-up and Understanding (5 ECTS credits)

OPPORTUNITIES FOR FURTHER STUDIES (MASTER’S PROGRAMMES)

With a Bachelor’s degree in Applied Industrial Electronics you continue on a MSc programme in Engineering. You can, among other things, study:

- Intelligent Reliable Systems, AAU Esbjerg (MSc in Engineering)
- Offshore Energy Systems, AAU Esbjerg (MSc in Engineering)
- Power Electronics and Drives, AAU Aalborg (MSc in Engineering)
The Bachelor’s degree in Applied Industrial Electronics qualifies you for different Master’s programmes at Aalborg University:

MASTER’S PROGRAMME IN INTELLIGENT RELIABLE SYSTEMS

The Master’s programme in Intelligent Reliable Systems at Aalborg University Esbjerg concerns process control, reliability demands, fault detection and diagnosis in dynamic software- and hardware systems. The programme features a variety of courses and projects within the area of intelligent reliable systems.

You will acquire competencies within system identification and identification and its application in engineering systems including comprehension of probability, statistic and stochastic processes. You will also work with fault diagnosis and reliability analysis. Upon graduation, you have attained a variety of skills and competences highly applicable in R&D departments in both small and large companies all over the world. As an engineer, you will participate in developing several of the products you know from your daily life. Also sales departments, manufacturing companies, consulting engineering companies and the public sector will be open to your career. You may also pursue a career as a PhD student.

NEW IDEAS ARE BORN EVERY DAY

“I chose this particular education because it provides the freedom to create, instil life and intelligence to a given system so it can serve for the greater good of society.

This line of education provides opportunities for design, development and prototyping of systems, which are automated and widely used in the commercial and industrial sector.

The programmes at AAU are practically orientated with the intention not only to give you theoretical knowledge, but also to prepare you for future engineering-related working positions. Via the group work on different projects such as “Magnetic levitation”, “Stabilisation of satellite dishes on a ship in open sea” and many more in combination with structure methodology for documentation of the work process. You are provided with interesting ways of learning-by-doing.”

KIRIL VASILEV PANEV FROM BULGARIA, STUDENT, INTELLIGENT RELIABLE SYSTEMS
MASTER’S DEGREE OPPORTUNITIES

MASTER’S PROGRAMME IN POWER ELECTRONICS AND DRIVES

Power Electronics and Drives (PED) is a specialisation of the Master’s programme in Energy Engineering offered at AAU in Aalborg. In this programme, you will study efficient and intelligent energy conversion by means of power electronic technology and electrical machines. You will study these topics analytically, numerically and experimentally in an innovative research environment.

This specialisation combines contemporary technologies with classic technologies such as power semiconductor devices, electronics, electromagnetics, digital signal processors, control theory, EMC and energy technology. You will obtain an understanding of the technologies and scientific disciplines involved in electric energy conversion by means of power electronic converters and electric machines.

Energy Engineers with a specialisation in Power Electronics and Drives can have a wide range of jobs including in R&D departments in major companies working with transformation of electrical energy to mechanical energy and vice-versa. You can work in project engineering, research, development and management in Danish and international industries or public institutions. Possible employers in your future may be Vestas, Danfoss, Grundfos, ABB, Siemens, KK Wind Solutions or Bang & Olufsen.

“THE PROJECTS ARE WELL TARGETED”

“My name is Vasilios. I am studying Power Electronics and Drives at Aalborg University. I was born in Sweden, but I consider myself Greek, as I have lived most of my life in Greece.

I came to Aalborg because of the study programme Power Electronics and Drives (Energy Engineering). The programme caught my attention by means of some very interesting publications that I read at my home university, and I believe the programme is well known within its field.

Problem based learning · I enjoy studying at Aalborg University, and I like that the projects are well targeted, and that any resources you might need are easily available through the laboratories, which was not the case at my home university.

My career · In my future, I would like to do a PhD if I get the opportunity. However, I could also see myself working in an R&D department. Right now, I have a student job in the university laboratory.

My advice for future students · I would advise future students to travel around when in Denmark. I am currently enrolled in some Danish language classes, and after three months, I started to understand what people were saying in the supermarket and so on. In Denmark you will do fine with English, but learning a little Danish will help you to feel more integrated and to understand the culture better.

VASILIOS, student, Power Electronics and Drives (Energy Engineering)
MASTER’S DEGREE OPPORTUNITIES

MASTER’S PROGRAMME IN OFFSHORE ENERGY SYSTEMS

Offshore Energy Systems (OES) is a specialisation of the Master’s programme in Sustainable Energy Engineering offered at AAU in Esbjerg.

Studying Offshore Energy Engineering, you learn about design, analysis and modelling of offshore energy systems and the system component interaction. You get to work with fluid mechanics and flow systems, such as CFD, multiphase flows, fluid power and mechanical systems, together with control, optimisation and diagnosis of offshore energy systems.

During the MSc specialisation in Offshore Energy Systems, you will study technologies related to all different kinds of energy systems such as offshore wind turbines, oilrigs, wave energy, etc.

The specialisation gives you an insight into various technologies for energy transmission, harvesting and control of offshore energy systems. Also, you gain knowledge about how to design, analyse and model mechanical systems, fluid power systems and electrical systems with complex dynamics and elements with non-linear behaviour.

Sustainable Energy engineers with the specialisation in Offshore Energy Systems have a wide range of job opportunities. You will be able to work in project engineering, research, development and management in Danish and international industries or public institutions. Your future employer may be Vattenfall, Ørsted (previously DONG Energy), Mærsk Olie og Gas, Offshore Center Danmark, Vestas Wind Systems, Siemens Wind Power, KK Wind Solutions or consultancies.
CAREER OPPORTUNITIES

The Bachelor’s programme in Applied Industrial Electronics is especially organised for those who wish to continue in a two-year Master’s program in engineering (MSc).

As an engineer in Applied Industrial Electronics you can handle complex and development-oriented situations in the electronics and power electronics area, and you possess competencies on microprocessor systems, electrical machines and robotic systems that can be used in development, planning and operation of industrial energy systems.

With an MSc in Engineering you can, for example, work in:
- The process industry
- The wind turbine industry
- Energy companies
- Manufacturing companies for electronics and electrical machines
- The offshore industry.
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. Aalborg University is host to a successful UNESCO Chair in Problem Based Learning in Engineering Education and a Centre for PBL and Sustainability approved by UNESCO. The Aalborg Centre for Problem Based Learning in Engineering Science and Sustainability under the auspices of UNESCO will build upon and develop the work of the UNESCO Chair and Centre for PBL and Sustainability, and is keenly supported by Aalborg University and the Danish Ministry of Science, Innovation and Higher Education.

When writing your problem based project, you will typically 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 in your subjects. 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.

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.

**BEST ENGINEERING UNIVERSITY IN EUROPE**

Aalborg University is ranked the best university in Europe and the eighth best university worldwide for engineering according to the Best Global Universities list published by U.S. News and World Report.
STUDENT LIFE

STUDY IN ESBJERG

Situated by the sea, Esbjerg is a town with more than 70,000 inhabitants. The town is characterised by wind energy, oil industry, and shipping. As a student at Aalborg University’s campus in 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.

FREE DANISH CLASSES

Learning the Danish language will significantly improve your chances of getting a job in Denmark after graduation. The municipality in Esbjerg offers free Danish classes for this purpose.
PRACTICAL INFORMATION

APPLICATION AND REQUIREMENTS

Admission to the Bachelor’s programme in Applied Industrial Electronics requires that applicants meet the following requirements or can document other equivalent qualifications:

• Passed an entrance examination (Upper Secondary School Leaving Examination, STX; Higher Preparatory Examination, HF; Higher Commercial Examination, HHX; Higher Technical Examination, HTX; qualifying vocational exam (completed EUX or completed Part 1 of the Merkantil EUX), admission course or equivalent)
• English B
• Mathematics A
• One of the following combinations:
  Physics B or Geoscience A

NOTE! Starting from 2019 a minimum grade of 4,0 will be required for Mathematics A.

IS YOUR MATH LEVEL SUFFICIENT?

Mathematics is an essential tool in the Applied Industrial Electronics program. A good guide when you apply is that you should have at least a grade of 7 in mathematics and have the potential to earn a grade of 10 in your upper secondary school mathematics exam.

It is strongly recommended that you brush up on A-level mathematics before beginning your studies if you have a grade of 7 or less in mathematics from your upper secondary program or if your upper secondary education is from one or more years ago.

ENGLISH LANGUAGE REQUIREMENTS

Bachelor’s programmes offered in English at Aalborg University require that you have a command of the English language equivalent to level B (Danish level) in English. Level B (Danish level) in regards to languages is considered equivalent to level B2 referring to Common European framework of Reference for Languages (CEFR).

English test must be submitted - by uploading test results to optagelse.dk:

The test must be less than two years old to be accepted. Danish B level in English compares to:

• IELTS (academic test): 6.5 www.ielts.org or
• TOEFL (paper-based): 560 www.ets.org/toefl (paper-based tests taken after september 2017 will not be accepted. As of the admission year 2019, no paper-based tests from TOEFL will be accepted).
• TOEFL (internet-based): 88 www.ets.org/toefl or
• Cambridge Certificate of Proficiency (CPE) www.cambridgeenglish.org or
• Certificate in Advanced English (CAE) www.cambridgeenglish.org or
• Cambridge First Certificate with the grade B www.cambridgeenglish.org (as of the admission year 2019 the Cambridge First Certificate will no longer be accepted).

When applying for a Bachelor’s programme, please apply via optagelse.dk

Deadline for application: 15 March at 12.00 noon.

TUITION-FREE STUDIES

Students from EU/EEA countries do not 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: www.apply.aau.dk
If you have questions about how to apply or general questions about studying in Denmark and life at Aalborg University, please contact:

**AALBORG UNIVERSITY ADMISSIONS OFFICE**
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E-mail: bacheloradmission@aau.dk

**INTERNATIONAL OFFICE IN ESBJERG**
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Niels Bohrs Vej 8
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E-mail: international@esbjerg.aau.dk

If you have questions regarding the study programme, please send an e-mail to esbjerg.sg@ses.aau.dk