Deutscher Akademischer Austauschdienst
German Academic Exchange Service


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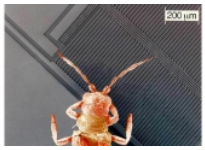
# Master's degree

## Micro- and Nanoelectronics – Master's Study Programme

RWTH Aachen University • Aachen






## Overview

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| **Degree** | Master of Science in Electrical Engineering, Information Technology and Computer Engineering |
| **Teaching language** | • English |
| **Languages** | The degree programme is taught in English. If modules are taught in a different language, this is indicated in the corresponding module catalogue.<br><br>Examinations are to be taken in English (or in agreement with the examiner in another language). |
| **Full-time / part-time** | • full-time |
| **Mode of study** | Fully on-site with voluntary online elements |
| **Programme duration** | 4 semesters |
| **Beginning** | Winter and summer semester |
| **Application deadline** | Non-EU applicants: 1 March for the following winter semester<br>EU applicants: 15 July for the following winter semester<br><br>Non-EU applicants: 1 September for the following summer semester<br>EU applicants: 15 January for the following summer semester |
| **Tuition fees per semester in EUR** | None |
| **Combined Master's degree / PhD programme** | No |
| **Joint degree / double degree programme** | No |
| **Description/content** | **IMPORTANT NOTICE:**<br><br>Students interested in the Micro- and Nanoelectronics major**have to apply** for the Master's degree programme in "**Electrical Engineering, Information Technology and Computer Engineering**". |

Once accepted and enrolled, they can choose any one of the six majors (Micro- and Nanoelectronics, Systems and Automation, Communications Engineering, Computer Engineering, Electrical Power Engineering , Biomedical Systems Engineering).

The domain- and subject-specific skills and competences attained at the Master's level in electrical engineering, information technology and computer engineering build upon the skills and competences from the Bachelor's level. Within the field of micro- and nanoelectronics, graduate coursework provides a high level of specialisation, research-related training, and in-depth, domain-specific knowledge at a professional level.

Micro- and nanoelectronics is a cross-disciplinary field covering knowledge and skills from other specialisations, such as biomedical engineering, computer engineering, and information and communication technology as well as electrical power engineering and the interactions with the following topics specific to micro- and nanoelectronics:

- devices, sensors, actuators, measurement instrumentation, and technology for fabrication
- analogue, mixed-signal, high frequency, and digital circuit design
- architecture, systems, and selected applications of VLSI systems

In many aspects, micro- and nanoelectronics is a system science. Graduates will be able...

- to apply theoretical concepts of system identification, modelling, and optimisation
- to take technical-scientific questions from practice, to understand the problems, to formulate them, and then communicate them to others in an appropriate way
- to analyse engineering and technology questions and formulate solutions
- to understand the impact of design activities on the life cycle of products
- to adequately report results and work practices both in writing and verbally using current technical language and terminology in order to persuade others about the benefits of new ideas and inventions
- to communicate adequately in their native language and in English

# Course Details

**Course organisation**

The standard period of study is four full-time semesters (two years), including the preparation of the Master's thesis. The course of study may be commenced in either semester.

The study programme consists of a range of mandatory or mandatory-elective modules that define the specific profile of the study programme.

This part of the curriculum is complemented by a**large offer of laboratory work, project work, and seminars**. In addition, there is a selection of possible courses that comprise courses from all other Master's study programmes offered by the faculty. Finally, there is an assortment of elective courses from the entire RWTH course programme, including courses in economics and soft skills as well as language courses. All Master's students must complete the "Scientific Integrity" module to meet ethical standards of scientific practice. German language courses are compulsory for all students who cannot certify a German language level of at least B1.

The **Master's thesis** is an independent, predefined scientific project to be completed in a fixed period of six months. It is concluded by an oral presentation and defence of the results.

A total of 120 ECTS credits are required for the successful completion of the programme, distributed among the various subject areas. Modules from the CORE department are mandatory and must be taken for at least 20 credits.
**Below you will find a visual structure of the Master's programme to see how many credit points are required in each subject area.**

The Master's programme utilises the following basic forms of teaching to achieve the defined goals:

- lectures – a serial presentation of material, including specific methodologies
- tutorials – solidifying and deepening expert knowledge and capabilities by solving problems associated with the lecture material
- seminar work – the elaboration of complex questions and scientific knowledge (Basic

knowledge is presupposed. Students give oral presentations in the seminar.)
- intensive courses – compact intensive courses composed of lectures and tutorials

Important additional options for gaining technical competence are available, such as:

- semester and Master's projects completed in small groups or individually
- excursions – expert guided tours of technical installations and facilities outside the university
- practical (e.g. laboratory) work directly related to lectures
- a minimum of 18 weeks of industrial experience and practice

View the PDF download below to will find our module catalogues:

» PDF Download

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| **A Diploma supplement will be issued** | Yes |
| **International elements** | • International guest lecturers<br>• Language training provided<br>• Training in intercultural skills<br>• Study trips<br>• Projects with partners in Germany and abroad<br>• Specialist literature in other languages<br>• Courses are led with foreign partners<br>• International comparisons and thematic reference to the international context |
| **Integrated internships** | Students are required to complete an industrial internship for a minimum period of 18 weeks as an integrated and compulsory part of their curriculum. During the eighteen-week industrial internship, students are trained to deal with practical engineering problems. Flexibility and open-mindedness are major qualifications of an electrical engineer. |
| **Special promotion / funding of the programme** | • DAAD<br>• Other (e.g. state level)<br>• ERASMUS+<br>• Franco-German University (FGU) |
| **Name of DAAD funding programme** | KASP – King Abdullah Scholarship Programme; IAESTE – internships for foreign students of engineering; support programmes for students from various countries (for example, Costa Rica, Argentina, Mexico, Colombia, Turkey, Paraguay, Tunisia) |
| **Course-specific, integrated German language courses** | Yes |
| **Course-specific, integrated English language courses** | No |

# Online learning

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| **Pace of course** | Instructor-led (Specific due dates for lectures/assignments/exams) |
| **Phase(s) of attendance in Germany (applies to the entire programme)** | None |

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| **Types of online learning elements** | • Discussion forums and / or groups<br>• MOOC (Massive Open Online Course)<br>• Online study material provided by institution<br>• Online tutorials<br>• Video learning (Pre-recorded videos, Vlogs, Video-Podcasts)<br>• Wikis |

## Costs / Funding

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| **Tuition fees per semester in EUR** | None |
| **Semester contribution** | Approx. 320 EUR student services contribution per semester<br><br>The fee includes a semester ticket covering public transport in all of North Rhine-Westphalia. |
| **Costs of living** | The cost of living and studying, including food, accommodation, personal and social expenses, and study-related costs, is estimated to be 1,132 EUR per month. Please note that single individuals have to give proof of a minimum income of 861 EUR per month at the immigration office in Aachen in order to be eligible for an extension of the residence permit (as of January 2023). Employment as a research assistant is possible. The salary for eight hours per week is about 487 EUR. |
| **Funding opportunities within the university** | Yes |
| **Description of the above-mentioned funding opportunities within the university** | In Germany, universities do not offer full-coverage scholarships. Prospective and current RWTH students, however, may apply for a scholarship from the Education Fund, which is worth 300 EUR per month: more information about the education fund.<br><br>Additionally, there are a number of trusts and foundations which offer scholarships. A full list of programmes and foundations can be found in the RWTH Scholarships Database: more information about the scholarships and funding programmes. |

## Requirements / Registration

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| **Academic admission requirements** | 1. In order to apply to the RWTH Master's programme Electrical Engineering, Information Technology and Computer Engineering with a Micro- and Nanoelectronics specialisation, applicants should have completed their basic studies (Bachelor of Science or Engineering or an equivalent academic degree) at an internationally recognised university. The basic study should fulfil the subject requirements listed below and in detail at the homepage of the Faculty of Electrical Engineering and Information Technology.<br>More information about subject requirements<br><br>• At least 28 ECTS credits for advanced mathematics<br>• at least 10 ECTS credits for physics and physical principles of electronic devices<br>• at least 34 ECTS credits for fundamentals of electrical engineering including circuit technology<br>• at least 12 ECTS credits for informatics (computer science) and programming<br>• at least 8 ECTS credits for fundamentals of control and mathematical systems theory<br>• at least 8 ECTS credits for advanced electromagnetic field theory or theoretical information theory |

- at least 20 ECTS credits for application-oriented courses

2. In addition, at the time of application, all applicants are obliged to prove that they have taken the Graduate Record Examination (GRE) General Test. The test score must fulfil the minimum requirements according to the current examination regulations. Applicants who are citizens of a member state of the European Union or the European Economic Area (EEA) as well as those with prior educational qualifications from Germany (so-called “Bildungsinländer”) are exempt from this rule.

3. Conditional admissions are possible. In this case, additional study requirements have to be fulfilled.

4. Admission to this Master's course requires proof of an adequate knowledge of the English language (see below).

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| **Language requirements** | Admission to this study programme requires proof of adequate knowledge of the English language (TOEFL-iBT 90, IELTS 5.5, or equivalent).<br><br>International students who cannot provide proof of German language skills at level B1 or better (according to the CEFR) are obliged to take German language courses as part of their curriculum (equivalent to 8 ECTS credits).<br><br>More information about language skills |
| **Technical equipment and programmes** | Devices: Laptop |
| **Application deadline** | Non-EU applicants: 1 March for the following winter semester<br>EU applicants: 15 July for the following winter semester<br><br>Non-EU applicants: 1 September for the following summer semester<br>EU applicants: 15 January for the following summer semester |
| **Submit application to** | **Please note** that you have to apply for the Master's degree programme in '**Electrical Engineering, Information Technology and Computer Engineering**" and then **choose the major Micro- and Nanoelectronics**.<br><br>Click here for the online application. |

# Services

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| **Possibility of finding part-time employment** | International students have very limited work opportunities while studying. Therefore, it is not possible to finance your entire studies through working alone. There are teaching and research assistant positions available at the involved institutes. These are, however, only awarded to students who have already started their academic studies in a programme. Students working as a teaching or research assistant may work a maximum of 19 hours a week but will usually not earn enough to cover all of their living expenses. By law, a student from outside the EU is permitted to work either 120 full days or 240 half days per calendar year. We do caution students to be careful about taking on outside work commitments, as completing a Master's degree within the designated two years will be difficult if a student spends too much time away from his or her studies. |
| **Accommodation** | RWTH Aachen University has a limited number of dorm rooms and studio apartments. However, there are usually waiting lists for these rooms, and students will probably need to find private accommodation first. There are a number of options for finding private accommodation in and around Aachen, and the International Office can provide students with information beforehand or |

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| | upon arrival.<br><br>The average rent per month for a flat starts from 400 EUR to 600 EUR.<br><br>Please note that there is only a very limited number of family apartments in the university dorms, which is why students who bring their spouses or families with them will most likely need to find private accommodation.<br><br>Rooms in university dorms cost between 200 EUR and 500 EUR, depending on room size. For short-term accommodation, there are many hotels and a youth hostel.<br><br>RWTH Aachen University also offers a housing guide for international degree and non-degree students: more information about accommodation in Aachen. |
| **Career advisory service** | Departmental academic adviser<br>Mentoring programme<br>RWTH Career Center |
| **Support for international students and doctoral candidates** | • Welcome event<br>• Buddy programme<br>• Cultural and linguistic preparation |
| **General services and support for international students and doctoral candidates** | • IDEA-League Research Grant<br>• UNITECH International<br>• Day of Electrical Engineering and Technology in Aachen<br>• Bonding company contact fair in Aachen<br>• RWTH Aachen University open day<br>• Dean's list at RWTH Aachen University<br>• Friedrich-Wilhelm Price<br>• Springorum Commemorative Coin from the support association of RWTH Aachen University<br>• Graduation ceremony |

## Our Partners

# RWTH Aachen University

Central part of RWTH Aachen University campus

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With 260 institutes in nine faculties, RWTH Aachen University is one of Europe's leading institutions for science and research. Currently, more than 47,000 students are enrolled in 173 academic programmes. More than 14,150 of them are international students hailing from 138 different countries. The scientific education students receive at RWTH Aachen University is firmly rooted in real-world application.

As a result, our graduates are highly sought after by businesses to work as trainees and fill executive positions. National and international rankings show that our graduates have a high aptitude for managing complex tasks, constructively solving problems in teams, and taking on leadership responsibilities. Thus, it should come as no surprise that one in five board members of German corporations is an alumnus of RWTH Aachen University. Work conducted in the research centres at RWTH Aachen University is strongly oriented towards the current needs of industry, commerce, and the professions. This has resulted in numerous innovations, patents, and licences. The individual competence centres at RWTH Aachen University collaborate effectively across departments and faculties in interdisciplinary groups and forums, while still maintaining a strong focus on their own department specialisation. For instance, the computer science and biology departments – and even the social sciences – all have a clear connection to the school's engineering focus. This has been a crucial factor in motivating multinational corporations such as Philips, Microsoft, and Ford to locate their research institutions in the Aachen region. Excellence in teaching and research constitutes the basis from which RWTH Aachen University works with other leading institutions and technical universities around the world. RWTH Aachen University is aware of its responsibility toward society and the environment and actively contributes to a sustainable higher education landscape.

## University location

As Germany's westernmost city, Aachen is located on the borders of Belgium and the Netherlands. Its population is about 260,000. Aachen's historic centre around the distinctive cathedral (UNESCO world heritage site) is characterised by a student lifestyle. At the city's doorstep, the hilly Eifel landscape with its rivers, lakes, and forests offers a picturesque countryside for outdoor recreation. Aachen benefits from its central location in the heart of Europe!

# Contact

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Faculty of Electrical Engineering and Information Technology

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https://www.facebook.com/rwth.elektrotechnik/

https://www.instagram.com/elektrotechnik.rwth/

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