

## **Regulations Governing Entry Requirements and Admission to the Quantum Technologies in Electrical and Computer Engineering Master's Degree Programme at Technische Universität Braunschweig**

This translation of the German version dated 23.10.2023 is provided for information purposes only.

If there is a discrepancy or inconsistency of meaning or interpretation between the English version and the original German version, the German version shall prevail.

On 23.01.2023, the Faculty Council of TU Braunschweig's Faculty of Electrical Engineering, Information Technology, Physics has adopted the following regulations according to Section 18, Paragraph 8, of the Lower Saxony Higher Education Act (Niedersächsisches Hochschulgesetz, NHG) and Section 7 of the Lower Saxony University Admissions Act (Niedersächsisches Hochschulzulassungsgesetz, NHZG):

### **1 Scope**

- (1) These regulations govern entry and admission to the English taught consecutive Master's degree programme in Quantum Technologies.
- (2) The entry requirements are set out in Section 2. In order to determine the entry requirements, the TU Braunschweig will be awarding all places based on the University's own selection process.
- (3) The places will be distributed based on the University's own selection process (Section 5).

### **2 Entry requirements**

(1) To enter the consecutive Master's degree programme in Quantum Technologies in Electrical and Computer Engineering, applicants must:

a) 1. Either have obtained a Bachelor's degree or an equivalent degree in electrical engineering, physics or computer science with a focus on natural sciences/engineering at a German higher education institution or at a higher education institution belonging to one of the Bologna signatory states or in another suitable previous degree programme in accordance with paragraph 2 or

2. Hold an equivalent qualification from a previous degree programme in electrical engineering, physics or computer science with a focus on natural sciences/engineering or a closely related field, awarded by a foreign university, according to Paragraph 2. Degree equivalency will be assessed according to the recommendations of the Central Office for Foreign Education (<http://anabin.kmk.org>, in German only), which is part of the

Secretariat of the Standing Conference of Ministers of Education and Cultural Affairs

and

b) Provide proof of qualifications as set out in Annex 1

and

c) Score at least six points in a selection interview (see Section 3). Applicants who, according to Section 3, did not score at least six points in the selection interview cannot be admitted.

(2) The decision whether the previous study programme according to Paragraph 1 a) is suitable in terms of subject matter is made by the selection committee (§ 6). A degree programme is considered to be suitable in terms of subject matter if there are no significant differences with regard to the knowledge and competences acquired in the Bachelor's degree programme in Electrical Engineering or Physics at the TU Braunschweig in the respective applicable examination regulations. As a rule, the degree programme is still considered to be suitable for the subject if knowledge and competences have been acquired in the subject areas listed in Annex 1 No. 1 to the minimum extent specified in each case and to a total extent of 60 credits.

(3) As an exception to Paragraph 1, Letter a), the University may provisionally admit applicants whose Bachelor's degree or equivalent qualification is pending at the time of application if they have accumulated at least 150 credits (83 %) in a degree programme with a total of 180 credits, or at least 180 credits (86 %) in a degree programme with a total of 210 credits, and if they are expected to complete their Bachelor's degree or equivalent qualification no later than 31 March for the winter semester or 30 September for the summer semester. A grade point average (GPA) is calculated based on the marks relevant to admission. This GPA is taken into account during the selection process explained in Section 5, Paragraph 2 and 3, regardless of the student's final GPA in their Bachelor's degree.

(4) Applicants who have not yet graduated in accordance with § 2 Paragraph 3 at the time of application shall be deregistered upon expiry of the deadline if they have not submitted their Bachelor's degree certificate to the university by 31 March of the respective winter semester if they commence their studies in the winter semester or by 30 September of the respective summer semester if they commence their studies in the summer semester, unless the applicant is not responsible for this.

(5) Applicants whose native language is not English must have a sufficient command of the language. Sufficient English proficiency must be demonstrated by achieving at least a minimum result in one of the following internationally recognised tests or an equivalent test:

<b>Test of English</b>	<b>Minimum result</b>
Test of English as a Foreign Language (TOEFL), internet-based test/IBT www.ets.org	95 credits
Cambridge English: Advanced (CAE) www.cambridgeenglish.org	Grade B or higher

Cambridge English: Proficiency (CPE) www.cambridgeenglish.org	Grade C or higher
International English Language Testing System (IELTS) www.ielts.org	Band 6,5 or higher
English Language Proficiency Report from TU Braunschweig's Language Centre	At least two skills at B2 level and two skills at C1 level in the Language Centre's English Language Proficiency Report

The successful completion of one of these tests must not date back more than three years from the date of application for admission to the Master's degree programme. Applicants who have successfully completed a study programme taught entirely in English are exempt from providing proof of a successful English test.

(5) Applicants do not have to prove any German language skills.

### 3

#### Selection Interview

(1) Before their acceptance, applicants must participate in a selection interview either conducted by the admission committee themselves or by people appointed by the admissions committee (Section 6). This selection interview is graded. Applicants who score less than six points cannot be admitted.

(2) The admission committee or the people appointed by the admissions committee will conduct the interview in English. The selection interview tries to determine whether or not an applicant is suited for the degree they are applying to. The selection interview will cover the applicant's motivation as well as the following suitability criteria:

1. Specific aptitudes and interests that could reflect positive on their degree
2. Particular motivation to study Quantum Technologies in Electrical and Computer Engineering
3. The ability to work scientifically, systematically and in a method-oriented way
4. Knowledge of the scientific principles or basic knowledge from the first degree

Each parameter will be awarded with either 0 points, 1 point, or 2 points. These points correspond to the following evaluation:

0 = not given / not convincing

1 = partially given / partially convincing

2 = given / convincing

The suitability parameters 3 and 4 are weighted twice when awarding points.

### 4

#### Start of the programme, admissions application, and application deadline

(1) The Master's degree programme in Quantum Technologies in Electrical and Computer Engineering starts every winter and summer semester. To apply for admission, an electronic

application form must be completed and submitted via the University's web portal. Application forms must then be printed, signed and submitted along with the supporting documents listed in Paragraph 2. Applications must reach the University no later than 15 July for the winter semester and 15 January for the summer semester. Applications for admission outside the regular application process and above the defined admission numbers must reach the University no later than 10 April for the summer semester and no later than 10 October for the winter semester. Both types of applications (Clauses 2 and 4) will be valid for admission to the programme for the starting date specified. The University is under no official obligation to verify the information provided by applicants.

(2) Where originals are not issued in English or German, certified German or English translations must be included. Applications for admission under Paragraph 1, Sentence 2, must include the supporting documents listed below:

- a) Degree certificate (Section 2, Paragraph 1, letter a) or, if this is pending, a certificate listing the student's achievements (with credits), number of credits, total number of credits earned, and GPA
- b) Curriculum vitae
- c) Proof of English language proficiency as set out in Section 2, Paragraph 5
- d) if applicable, according to Paragraph 2, Section 1, Letter b), evidence of knowledge, skills, and credits according to Annex 1 (e.g. excerpts from module manuals), if the attached documents according to letter a) cannot provide sufficient evidence
- e) if applicable, additional proof of subject-specific qualifications as set out in Section 2, Paragraph 1, letter b)

The requirements set out in Sentence 1 also apply to applications for a place above admission capacity, without however affecting the additional requirements applicable to that process. In addition, applicants must submit a sworn statement confirming that they have not received an offer or a conditional offer of a place in the Master's programme in Quantum Technologies in Electrical and Computer Engineering or parts of that programme, or a related degree programme at a university in Germany or in another European Union Member State. This statement must include the applicant's nationality.

(3) Applications that are incomplete, not in the proper form, or not submitted by the deadline will be excluded from further consideration. The submitted documents will remain with the university.

## 5

### **Selection and admission process**

(1) Admission is generally granted for the Quantum Technologies in Electrical and Computer Engineering master's degree.

(2) Places are allocated according to the results of the university's own selection process.

(3) Selection decisions are made as set out below:

a) Taking into account the final grade or GPA (Section 2, Paragraph 3), a ranking is created, with the first place on the list being awarded to the best grade. If there are several applicants with the same score, they will be ranked at random.

b) In order of the ranking, selection interviews (Section 3) with the applicants will be conducted by the selection committee or persons appointed by it (Section 6). In order to limit the number of participants in the selection interviews, applications are preselected in a quantity up to twice the number of places available. The final grade (converted into points, A) is combined with the score (B) awarded in the selection interview according to Section 3 Paragraph 2 and weighted accordingly. The weighting of the final grade and the selection interview is 60% to 40%.

The final grade is converted according to the following table:

Grade	1.0- 1.2	1.3- 1.6	1.7- 1.9	2.0- 2.2	2.3- 2.6	2.7- 2.9	3.0- 3.2	3.3- 3.6	3.7- 3.9	4.0
Points	12.5	12.0	11.5	11.0	10.5	10.0	9.5	9.0	8.5	8.0

The weighted grade is calculated according to the following formula:

$[(6 \times A) + (4 \times B)] / 10$ . Based on this calculation, the selection committee or the people appointed by it create a new ranking, with the first place on the list being awarded to the applicant with the highest score achieved. If there is a tie, the average grade according to Section 2, Paragraph 3 determines the order. If there is still a tie between individual applicants, the ranking order on the list will be decided by drawing lots.

(4) Furthermore, the general provisions for enrolment according to the enrolment regulations of the university remain unaffected.

## 6

### **Admissions Committee for the Master's degree programme in Quantum Technologies in Electrical and Computer Engineering**

(1) The Faculty of Electrical Engineering, Information Technology, Physics forms a selection committee for the preparation of the admission and the selection decisions.

(2) This selection committee consists of three voting members who must belong to the group of university teachers or scientific staff, and one member of the student group with an advisory vote. At least one member must belong to the group of university teachers. The members and three substitutes are appointed by the Faculty Council of the Faculty of Electrical Engineering, Information Technology, Physics. The term of office for the members is two years, and for the student member one year, with the possibility of reappointment. The selection committee is quorate if at least two voting members are present. The selection committee may appoint other professionally qualified persons

belonging to the group of university teachers or scientific staff to conduct the selection interviews.

- 3) The Admissions Committee or the people appointed by it have the following responsibilities:
  - a) Checking that entry requirements as set out in Section 2 are met
  - b) Deciding on whether a degree programme is considered to be closely related in subject matter according to Section 2, Paragraph 2
  - c) Deciding on ancillary provisions according to Section 2, Paragraph 2, Sentence 2
  - d) Carrying out selection interviews as set out in Section 2 and Section 6, Paragraph 3, sentence 1, letter b)
  - e) Ranking all applications according to their performance in the selection interviews as set out in Section 5
  - f) Deciding on the success of individual applications and notifying the Admissions Office or International Office who in turn send out letters of admission or rejection to the applicants

## 7

### **Selection interview process**

- (1) The following principles apply to the selection interviews: Usually selection interviews for the winter semester will take place between mid-July and the end of August. Selection interviews for the summer semester will take place between mid-January and the end of February. Selection interviews will take place by video conference. The University will notify applicants of the exact date and location of their interview within an appropriate period of time. The Admissions Committee or the people appointed by it (Section 6) will hold individual selection interviews of approximately 15 minutes with each applicant. A protocol regarding the essential questions and answers of the interview must be kept and signed by the selection committee or the people appointed by it. The protocol must include the date and location of the interview, the names of the members of the selection committee or the appointed people, the name of the applicant, and the evaluation.
- (2) Applicants who fail to attend their interview without good reason are excluded from the selection process. If there is good reason, the Admissions Committee will set a new date for the selection interview at the applicant's request. Proof of the good reason as well as the request for a new interview date must be submitted immediately, and no later than two days after the original interview date.

## 8

### **Notifications, waiting list procedure and process completion**

(1) Applicants who are offered a place in the programme are notified by the University in writing. This notification specifies a deadline by which the applicant must accept or decline the offer in writing, either on paper or electronically. If an applicant's reply is not received within the specified deadline or in the proper form, the offer of a place lapses. Applicants must be informed of this legal consequence in the written notification.

(2) Applicants who cannot be offered a place in the programme are notified by the University in writing with information on legal remedies. If a selection procedure has been carried out according to Section 5, the applicant's position in the ranking and the position of the last applicant admitted must be listed. They also include a request for the applicant to state, in writing (on paper or electronically) by a specified deadline, whether they wish to be wait-listed. Applicants who do not submit their reply by the deadline or in the proper form are excluded from the waiting list. Applicants must be notified of this legal consequence.

(3) The waiting list procedure is based on the rankings as set out in Section 5, Paragraphs 3 and 4.

(4) The admissions process will end no later than the beginning of the semester. Informal applications may be submitted for any places on the programme available after that date. Places are allocated by random draw from the applications received, provided they meet the entry requirements as set out in Section 2. The application period for this starts six weeks before the beginning of the semester (1 October for winter semesters and 1 April for summer semesters) and ends with the completion of the admissions process.

## 9

### **Admission to a higher programme semester**

(1) The prerequisite for admission to a higher semester is a completed degree program according to Section 2, Paragraph 1, letter a), proof of knowledge and competences according to Section 2, Paragraph 1, letter b), and the required minimum score in the selection interview according to Section 2, Paragraph 1, letter c), as well as the requirement according to Section 2, Paragraph 5. The selection committee or the people appointed by it (Section 6) may attach a condition to the finding that knowledge and competences are missing according to Annex 1 Number 2, which requires the applicant to complete the missing qualifications for up to 15 credits until the registration of the Master's thesis.

(2) Applicants who have not received their Bachelor's degree certificate by the end of the application period may be admitted if proof is given that they meet the entry requirements as set out in Section 2. Their Bachelor's degree certificate must then be presented on enrolment.

**10**  
**Entry into force**

These regulations will come into effect on the day following their publication throughout the university.



### Annex 1

1. The knowledge and competences required in accordance with § 2 paragraph 1 b) are generally present if knowledge and competences have been acquired in each of the following areas to at least the extent specified in each case:

Field	Subject areas	Scope
<b>Mathematics and basic physics</b>	<p>Applicants know essential basic mathematical and physical concepts. They are proficient in the most important calculation techniques in the following areas:</p> <ul style="list-style-type: none"> <li>• Ordinary differential equations</li> <li>• Integral calculus in several real and complex variables</li> <li>• Differential calculus in several real and complex variables</li> <li>• Linear algebra and analytical geometry</li> <li>• Statistics and probability theory</li> </ul> <p>They have knowledge in the areas of</p> <ul style="list-style-type: none"> <li>• Mechanics and thermodynamics</li> <li>• Optics and atomic physics</li> </ul>	<b>min. 15 credits</b>

<p><b>Fundamentals and core areas of electrical engineering and information technology</b></p>	<p>Applicants have knowledge of the fundamentals and core areas of electrical engineering and information technology. This includes knowledge in the following areas:</p> <ul style="list-style-type: none"> <li>• Fundamentals of electrical engineering (in particular basic equations of simple field problems and calculations of simple linear electrical networks)</li> <li>• Networks (in particular methods of network analysis such as graph theory and mesh impedance methods as well as system behaviour of networks)</li> <li>• Materials in electrical engineering (in particular the fundamentals of quantum mechanics and material properties important for electrical engineering)</li> <li>• Measurement technology (in particular the use and dimensioning of electrical sensors for non-electrical variables and the most important measuring devices)</li> <li>• Guided electromagnetic waves (in particular the routing of electromagnetic waves on cables, design and dimensioning of cable systems)</li> <li>• Electromagnetic field theory (in particular derivation and interpretation of Maxwell's equations, Hertzian dipole, waveguides)</li> <li>• Fundamentals of electronics (in particular principles, modes of operation and electrical properties of various semiconductor components)</li> <li>• Fundamentals of energy technology (in particular grid calculation, relationships with regard to grid stability and security of supply with electrical energy, functions of electromagnetic converters, basic converter circuits)</li> <li>• Circuit technology (in particular elementary integrated CMOS circuits)</li> <li>• Fundamentals of information technology (in particular fundamentals of communication, telecommunications and high-frequency technology)</li> <li>• Fundamentals of control engineering (in particular modelling of dynamic systems, controller design for linear systems and stability analysis)</li> <li>• Programming</li> <li>• In-depth knowledge in at least one relevant electrotechnical or physical elective area</li> </ul>	<p><b>min. 45 credits</b></p>
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2. The module descriptions of the Bachelor's degree programme in Electrical Engineering or Physics at TU Braunschweig are used to compare the knowledge and competences to be demonstrated.