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## **Statutes on the aptitude test for the Bachelor's Programme Aerospace at the Technical University of Munich**

**From 26 April 2021**

Legible version  
in the version of the amending statutes of 26 July 2021

On the basis of Article 13, Paragraph 1, Sentence 2 in conjunction with Article 44, Paragraph 4, Sentence 7 of the Bavarian Higher Education Act (BayHSchG) and Section 34 of the Qualification Ordinance (QualV) (BayRS2210 1 1 3 K/WK), the Technische Universität München hereby enacts the following Statutes:

### **§ 1**

#### **Purpose of the determination**

- (1) <sup>1</sup>The admission of the Bachelor's degree program Aerospace at the Technical University of Munich into the first or a higher semester requires a special qualification. <sup>2</sup>The Bachelor's Programme Aerospace has a special programme profile, which is described in Annex 1. <sup>3</sup>Therefore, in addition to the prerequisites listed in the Fachprüfungs- und Studienordnung (FPSO) in the current version, proof of aptitude must be provided in accordance with the following regulations.
- (2) <sup>1</sup>The purpose of the procedure is to determine whether, in addition to the qualification demonstrated by the acquisition of the higher education entrance qualification, the aptitude for the special qualitative requirements of the Bachelor's degree programme Aerospace is present. <sup>2</sup>For this study programme, the following study programme-specific competences (aptitude requirements) must be fulfilled in addition to the university entrance qualification (HZB):
1. Above-average competencies in subjects from the STEM spectrum (mathematics, physics, chemistry, biology, computer science, technology, and engineering), especially the ability to think abstractly, logically, and systems-oriented.
  2. Special understanding of technically complex issues as well as the competence to develop solutions by linking methodically different subject cultures, such as engineering and natural sciences, in a target-oriented manner.
  3. Creativity and resourcefulness to work on and develop technical and scientific issues independently and in a goal-oriented manner.
  4. Due to the fact that the course is conducted in English, a good understanding as well as clear and precise argumentation skills in English, especially when presenting engineering and technical issues.

## § 2 Procedure

- (1) The procedure for determining aptitude is carried out once every six months in the summer semester for the following winter semester and in the winter semester, but only for applications for higher semesters for the following summer semester.
- (2) Applications for admission to the assessment procedure for the following winter semester must be submitted to the Technische Universität München in the online application procedure by July 15 and for the summer semester by January 15 (cut-off deadlines).
- (3) Applications and eligibility determinations are in English.
- (4) The application shall be accompanied by:
  1. curriculum vitae in tabular form;
  2. Documents required in accordance with § 7 Para. 3 of the statutes of Technische Universität München on enrolment, re-enrolment, leave of absence and exmatriculation (ImmatS), as amended;
  3. Details of the HZB;
  4. Justification of a maximum of two pages for the choice of the aerospace course of study at the Technical University of Munich, in which the applicants explain which abilities, talents and interests make them particularly suitable for the intended course of study; their general personal background can also contribute to this, e.g. extracurricular involvement;
  5. If available, evidence of special extracurricular qualifications relevant to the degree programme or additional qualifications (e.g. participation in a research competition, degree programme-specific vocational training or other degree programme-specific practical work experience, voluntary internships relevant to the degree programme that go beyond the internship required in § 36 Para. 3 FPSO, thematically appropriate practical seminars);
  6. assurance that the justification for the choice of the course of study was prepared independently and without outside help and that the ideas taken from outside sources are marked as such.

## § 3 Commission

<sup>1</sup>The aptitude test is carried out by a commission appointed by the dean. <sup>2</sup>Its size depends on the number of applicants and consists of more than half university lecturers within the meaning of Art. 2 Para. 3 Sentence 1 BayHSchPG, and the rest of academic staff. <sup>3</sup>One of the students nominated by the student council shall act in an advisory capacity on the commission. <sup>4</sup>The commission is chaired by the dean or the dean of studies appointed by him or her. <sup>5</sup>In all other respects, the procedural rules from Art. 41 BayHSchG apply. <sup>6</sup>The members of the commission are appointed for two years; extensions are possible. <sup>7</sup>If the commission is active according to these statutes, the revocable transfer of certain tasks to individual commission members is permissible. <sup>8</sup>If, in accordance with sentence 7, only one member of the commission is active in the performance of certain tasks, this member must be a university lecturer. <sup>9</sup>If, pursuant to sentence 7, two or more members of the commission are active in the performance of certain tasks, at least half of them must be university teachers. <sup>10</sup>The commission shall ensure an appropriate allocation of responsibilities.

## § 4 Admission requirement

<sup>1</sup>Admission to the assessment procedure requires that the documents mentioned in § 2 Para. 4 have been submitted to the Technische Universität München in due form and time and in their entirety. <sup>2</sup>If this is not the case, admission to the assessment procedure will not be granted.

## § 5 Implementation: First stage

(1) In the first stage of the suitability determination procedure, an evaluation is carried out from the criteria:

1. average grade of the HZB and
2. subject specific grades

<sup>1</sup>The grades listed in the HZB in mathematics (triple), English (single) and at least one science or computer science (double) that was continued until the HZB was obtained are used as subject-specific individual grades. <sup>2</sup>If several scientific subjects were continued, their grades can also be specified and taken into account with double weighting. <sup>3</sup>In this case, the average grade obtained in the last four half-years prior to the acquisition of the HZB is used - including, if applicable, the final grades in these subjects listed in the HZB. <sup>4</sup>If no half-year grades are shown, the average grades shown in the HZB are used accordingly. <sup>5</sup>The grades for the Facharbeit or a comparable achievement are not taken into account. <sup>6</sup>The subject-specific individual grades are added together and divided by the weighted number of individual grades. <sup>7</sup>If no grade is shown in the HZB for a subject mentioned in sentence 2, the divisor is to be reduced by the corresponding number. <sup>8</sup>If no marks are available for the last four half-years in the subjects mathematics, English or at least one science or computer science continued up to the attainment of the HZB, the basic understanding in these areas must in this case be demonstrated in accordance with Paragraph 3 No. 1 Sentence 2 and Sentence 3 by participation in the second stage. <sup>9</sup>Provided that all individual grades required in accordance with sentence 8 are available except for the English grade, a recognised English certificate (level at least B2) may be submitted instead of participation in the second stage. <sup>10</sup>This proof is deemed to have been provided in the case of applicants with English-language training.

3. Extracurricular qualifications or additional qualifications relevant to the course of study.

<sup>1</sup>As extracurricular qualifications or additional qualifications relevant to the course of study, a maximum of one relevant vocational training or apprenticeship, an internship of at least four weeks relevant to the subject, successful participation in studium MINT (orientation semester at TUM) as well as successful participation in the competitions "Jugend forscht" (Youth Research) or "Mathematik-Olympiade" (Mathematics Olympiad) (at least distinction at the state level) are taken into account for each applicant. <sup>2</sup>The qualifications must be verifiable by the applicant and corresponding documents must be attached to the application in accordance with § 2 Para. 4. <sup>3</sup>The commission decides on the recognition of the stated extracurricular qualifications or additional qualifications.

(2) The following shall apply to the conduct of the evaluation:

1. <sup>1</sup>The average grade of the HZB is converted into points (HZB points) on a scale from 0 to 100, where 0 is the worst conceivable grade and 100 is the best possible grade. <sup>2</sup>The scale is to be chosen in such a way that a just passed HZB is assessed with 40 points (conversion formula see Appendix 2). <sup>3</sup>Those who claim that they were prevented from achieving a better average grade in the HZB for reasons for which they are not responsible will, on application, be involved in the procedure with the average grade, as evidenced by school reports.
2. <sup>1</sup>The result of the evaluation of the subject-specific individual grades according to Para. 1 No. 2. will be converted according to No. 1 on a scale from 0 to 100 (conversion formula see

Annex 2). <sup>2</sup>If this value is not an integer, it will be rounded up to the nearest whole number in favour of the applicant.

3. <sup>1</sup>Each relevant extracurricular qualification or additional qualification recognised by the Commission in accordance with Para. 1 No. 3 will be assessed in accordance with Annex 2 No. 4. <sup>2</sup>can achieve a maximum of 4 points from the area of extracurricular qualifications or additional qualifications.
4. <sup>1</sup>The total score for the first stage is the sum of the HZB points multiplied by 0.5 (see No. 1) and the points from No. 2 multiplied by 0.5 as well as the total number of additional points from No. 3. <sup>2</sup>If this value is not an integer, it will be rounded up to the next whole number in favour of the applicant. <sup>3</sup>The maximum number of points that can be achieved for the Bachelor Aerospace in the first stage is 100 points. <sup>4</sup>Scores above 100 points are theoretically possible due to para. 2 no. 3, but are limited to 100 points - and thus already the best possible suitability - for the result determination according to para. 3.
5. <sup>1</sup>In deviation from No. 1 and No. 2, in the case of graduates of the master craftsman's examination and of vocational further training examinations equated to the master craftsman's examination by the Ministry of State, the criterion according to No. 1 is replaced by the criterion of the arithmetic mean of the individual grades of the respective examination parts and the criterion according to No. 2 is replaced by the criterion of the named subject-specific individual grades in the subjects mathematics (triple), English (single) and at least one natural science or computer science (double) of this examination which was continued up to the attainment of the HZB. <sup>2</sup>In the case of graduates of Fachschulen and Fachakademien, in deviation from No. 1 and No. 2, the criterion according to No. 1 is replaced by the criterion of the overall examination mark or, if no overall examination mark is shown, by the criterion of the arithmetic mean of the individual marks of the subjects (with the exception of electives) of the final examination certificate and the criterion according to No. 2 is replaced by the criterion of the subject-specific examination mark. <sup>2</sup> is replaced by the criterion of the subject-specific individual marks in mathematics (triple), English (single) and at least one science or computer science (double) in the final report which was continued until the award of the HZB. <sup>3</sup>If no mark is shown for a named subject, the divisor is to be reduced by the corresponding number. In this case, the basic understanding in the subjects named in § 1 is to be demonstrated by participation in the second stage in accordance with § 5 Para. 3 No. 1 Sentence 2 and Sentence 3. <sup>4</sup>Provided that all individual grades required in accordance with sentence 3 are available except for the English grade, a recognised English certificate (level at least B2) may be submitted instead of participation in the second stage. <sup>5</sup>This proof is deemed to have been provided in the case of applicants with English-language training.

(3) Result of the first stage of the aptitude test

1. <sup>1</sup>Those who achieve 78 points or more in the first stage are admitted. <sup>2</sup>This does not apply if the continued subject-specific individual grades in the subjects mathematics, English and a natural science or computer science continued until obtaining the HZB were not shown in the HZB. <sup>3</sup>Even if the score is achieved, the subject-specific aptitude must be proven by passing the second stage of the procedure.
2. <sup>1</sup>If the point value calculated in accordance with Para. 2 is 70 points or less, applicants are not considered suitable. <sup>2</sup>This also applies if applicants lack individual subject-specific grades.

- (4) <sup>1</sup>The remaining applicants will proceed to the second stage of the aptitude test. <sup>2</sup>Within the framework of the second stage of the aptitude test procedure, a selection interview is invited. <sup>3</sup>The date of the interview will be announced by the Commission at least one week in advance.
- (5) Applicants who would have to be rejected in accordance with subsection 3 no. 2 may exceptionally take part in the second stage of the aptitude test procedure if they can provide evidence of having completed three years of vocational training relevant to the course of study.
- (6) In deviation from paras. 1 to 3, applicants who were enrolled in the same or a related degree programme and who are not to be admitted directly in accordance with the criteria for the first stage shall take part in the second stage of the aptitude assessment procedure if they can provide evidence of at least 20 credits per semester already completed.
- (7) <sup>1</sup>By way of derogation from paras. 1 to 3, those applicants who submit a hardship application will also take part in the second stage. <sup>2</sup>All documents must be enclosed with the application. <sup>3</sup>The applicant must prove that there are such serious health, social or family reasons in his or her person that it is not proportionate, applying particularly strict standards, for the applicant to be rejected in the first stage.

## § 6

### Implementation: Second stage

- (1) In the second stage of the aptitude test procedure, the average grade of the HZB and the result of the selection interview are evaluated, whereby the average grade of the HZB is to be considered at least equally.
- (2) <sup>1</sup>The selection interview is not public and is held in English. <sup>2</sup>It is conducted as an individual interview with two members of the commission, one of whom must be a university lecturer within the meaning of Art. 2 Para. 3 Sentence 1 BayHSchPG. <sup>3</sup>With the consent of the applicant, a member of the student group may be admitted to the audience. <sup>4</sup>The duration of the interview is at least 15 minutes and should not exceed 25 minutes. <sup>5</sup>The purpose of the interview is to determine whether the applicant can be expected to achieve the goal of the course of study independently and responsibly on a scientific basis. <sup>6</sup>No special previous knowledge beyond the level of a general secondary school education will be examined in the interview, unless an application in accordance with § 5 Para. 5 has been submitted. <sup>7</sup>The subject of the interview may also be the documents submitted in accordance with § 2 Para. 4. <sup>8</sup>The date set for the interview must be observed; anyone who fails to appear at this date shall be deemed not to be suitable. <sup>9</sup>Reasons to justify a failure to appear for which the applicant is not responsible must be notified in writing to the Chairperson of the Qualifications Committee by the beginning of the scheduled date and must be made credible. <sup>10</sup>If the reason is accepted, the applicant will be invited to an alternative date. <sup>11</sup>If the request is justified and approved by the Commission, a selection interview by video conference is possible. <sup>12</sup>The applicant bears the risk in the event of any technical problems, unless these are the responsibility of the Technische Universität München. <sup>13</sup>The content of the interview covers the following topics:
1. Mathematical knowledge that does not only refer to pure calculation skills, but points to mathematical-logical competences that can be applied to solve engineering problem areas arising in the Bachelor's degree programme Aerospace,
  2. Knowledge of engineering and natural sciences, including computer science, beyond basic understanding, in particular the ability to apply common concepts and terms to engineering issues,

3. Ability to combine prior knowledge from methodologically fundamentally different subject cultures and thus demonstrate the existence of an interdisciplinary problem-solving strategy necessary for successful work in the engineering sciences,
4. Course-supporting extracurricular qualifications and engagements in the natural sciences and engineering as well as at their interfaces,
5. Language skills combined with clear and concise reasoning ability in English.

<sup>14</sup>The individual topics will be weighted as follows in determining the selection interview score:

1. **Mathematical Knowledge (25 points):**  
The candidate is able to describe practical applications of mathematics quantitatively using available mathematical tools; the candidate can analyse problems presented and apply calculation laws and methods in such a way that usable results are generated in a reasonable time, e.g. the application of school material in certain geometric problems or the calculus of instructions in the description of velocities in simple physical movements;
2. **Knowledge of technology and science, including computer science (20 points):**  
You will be familiar with basic concepts and principles at school level in the above fields and will be able to explain the main concepts and recent developments in science, technology and computing;
3. **Ability to solve qualified interdisciplinary problems from the fields of mathematics, technology, natural sciences including computer science as well as the ability to combine previous knowledge from methodologically fundamentally different subject cultures (35 points):**  
Applicants are able to classify scientific, mathematical and technical questions in processes of everyday life with regard to the applicability of engineering problem areas; connections between the disciplines involved are recognised and proposals for solutions can be developed by comparing possible alternatives;
4. **Course-specific extracurricular qualifications (10 points):**  
Beyond the school day, the applicant is involved, for example, through active participation in research competitions or work/project groups with a scientific or technical focus;
5. **The candidate is able to answer questions related to subject matter and to explain concepts and solution steps (10 points):**  
It is argued clearly and precisely with examples and using the relevant technical terms and argumentation structures in English.

<sup>15</sup>On the basis of the weighting regulated in sentence 14, each participating commission member evaluates the selection interview according to the following scale, subject to the HZB points to be taken into account in accordance with paragraph 3:

Rating	Points
Excellent	91-100
Good	75-90
Satisfactory	60-74
Sufficient	40-59
Poor	20-39
Insufficient	0-19

<sup>16</sup>The overall evaluation of the selection interview is the arithmetic mean of the individual evaluations by the participating commission members, rounded up to the next highest whole number if necessary.

- (3) <sup>1</sup>The overall evaluation of the second stage is the sum of the HZB points multiplied by 0.5 (see § 5 Para. 2 No. 1) and the points of the selection interview multiplied by 0.5 (see Para. 2). <sup>2</sup>If this value is not an integer, it will be rounded up to the next highest number in favour of the applicant.
- (4) If the total score formed in accordance with subsection 3 is 75 or higher, suitability is established on the basis of the result of the second stage of the suitability determination procedure.
- (5) Applicants with an overall score of 74 or less are unsuitable for the programme.

### **§ 6 a Deception, breach of order**

<sup>1</sup>If applicants attempt to influence the result of the aptitude test by deception or the use of unauthorised aids, they will be deemed unsuitable. <sup>2</sup>disrupt the proper course of the aptitude test procedure may be excluded from continuing the procedure and are also considered unsuitable.

### **§ 7 Notices**

<sup>1</sup>The result of the suitability determination procedure is communicated by means of a decision. <sup>2</sup>If there is no margin of discretion in the evaluation of the individual criteria and in the determination of the overall results of the first and second stage, a decision by the Commission is not required. <sup>3</sup>Rejection notices must be substantiated and accompanied by instructions on how to appeal.

### **§ 8 Documentation**

<sup>1</sup>The course of the suitability determination procedure must be documented, in particular the assessment of the selection interview by the commission members as well as the overall result must be evident from this. <sup>2</sup>Minutes must be taken of the selection interview, showing the date, duration and place of the assessment, the names of the commission members involved, the names of the applicants and the main topics of the interview.

### **§ 9 Repeat**

<sup>1</sup>Those who have not provided proof of suitability for the intended course of study may re-register once for the aptitude test. <sup>2</sup>A further repetition is not possible. <sup>3</sup>In justified exceptional cases (written proof of e.g. illness), registration for a further date is possible.

### **§ 10 Entry into force\*)**

<sup>1</sup>These Statutes shall enter into force on 15 May 2021. <sup>2</sup>It shall apply from the winter semester 2021/22.

- \*) This provision concerns the entry into force of the Articles of Association in the original version of 26 April 2021. The date of entry into force of the amendments is specified in the amending Articles of Association.



## Annex 1

The Bachelor's Programme Aerospace offers enthusiastic, committed young adults the opportunity to complete a challenging, scientifically sound, thematically focused, engineering degree programme. The thematic focus of the foundation-oriented study program on the relevant engineering, but also mathematical and scientific knowledge in the field of aerospace enables an early and targeted specialization in terms of content. In this way, the analytical, creative and constructive skills for research and development in the fields of aeronautics and astronautics are taught and promoted on the basis of the broad specialist knowledge, which is deepened in selected sub-areas.

The extremely high safety requirements placed on aerospace engineers as well as the constant testing and questioning of existing limits and prevailing solutions and systems place aerospace engineers under a great deal of pressure in the area of tension between "innovation" and "absolute reliability". They work at the interface between different fields of knowledge and require fundamental, subject-specific and also highly qualified interdisciplinary knowledge as well as an understanding of the different approaches of the disciplines involved. The Bachelor's degree program Aerospace prepares students for the multitude and heterogeneity of these challenges and enables them to shape them. For this reason, the Aerospace study program places high demands on the special prerequisite skills of the future students. A high technical-constructive understanding paired with strong analytical skills as well as a systematic-methodical approach are required; further important skills are judgment, decision-making ability and conceptual strength. In addition, students need the ability to think holistically, so that they can grasp large and complex systems consisting of many complex individual parts and processes in their entirety or design and construct them. Without these prerequisites, a Bachelor's degree in Aerospace cannot be successfully completed.

Aerospace engineers work in an extremely interdisciplinary, transdisciplinary and international environment, which is also reflected in their very diverse range of activities. They must be able to network the knowledge and skills from the most fundamentally different disciplines and make them usable for specific technical applications. For this reason, the training focuses from the outset on interdisciplinarity, sustainability and the special challenges of the technological boundaries from extreme material stress to maximum energy efficiency.

The Bachelor's degree is structured in such a way that in the first semesters the fundamental mathematical, engineering and scientific principles are taught in breadth and also in depth in relevant areas. On this foundation, students develop the ability to think in a networked and interdisciplinary manner, and then move on to the subsequent modules, which deal with topics such as fluid mechanics, thermodynamics and heat transport. The various areas of specialisation available in the degree programme (system, drive, fluid dynamics, structure as well as dynamics) are each characterised by their own very high degree of specialisation. In order to specialise in the individual areas, students need to have a broad knowledge of the technical and scientific fundamentals on the one hand, and comprehensive basic knowledge in all five areas of specialisation on the other. Students must be able to understand the various disciplines and fields so that they can link them together and develop approaches to solutions. For this reason, it is imperative that applicants are able to independently acquire content that was not represented in school lessons, but which is an indispensable foundation for engineering studies at university level. In addition, they must be able to directly link this newly learned content in an interdisciplinary manner and thus gain access to entirely new subjects such as control engineering, fluid mechanics or computer-aided modelling and simulation or materials science.

Applicants must prove this ability on the basis of their degree qualification, whereby both the overall assessment and the grades in the scientific-technical subjects are important. A solid basic education in these subjects is indispensable for admission to university studies. In order to take into account the close international networking in the aerospace sector, the study programme is already offered in English at Bachelor level, so that adequate knowledge of English is a prerequisite.

## Annex 2

### Conversion formulas

The conversion of different grading scales into points on a scale from 0 to 100 is carried out according to the regulations No. 1 to 3. 100 points correspond to the best possible evaluation and 40 points to a performance that has just been evaluated as passed in the respective initial grading system.

#### 1. German grading system

with 1 as the best and 6 as the worst grade

#### Points = 120 - 20 \* Grade

The grades 1, 2, 3, 4, 5 and 6 therefore correspond to 100, 80, 60, 40, 20 and 0 points. Since HZB grades are only given to one decimal place in German certificates, no rounding to whole numbers is necessary when applying formula no. 1.

#### 2. German point system (e.g. Kollegstufe)

with 15 as the best and 0 as the worst score

#### Points = 10 + 6 \* Point value

#### 3. any numerical staff system

with grade N where  $N_{opt}$  is the best grade and  $N_{best}$  is just enough to pass.

#### Points = 100 - 60 \* (N<sub>opt</sub> - N) / (N<sub>opt</sub> - N<sub>best</sub>)

If the number of points calculated according to the formula given is not an integer, it will be rounded up to the nearest whole number.

Example: In the Bulgarian grading system,  $N_{opt} = 6$ ,  $N_{best} = 3$  and 1 is the worst possible grade. The given formula simplifies to: Points = 100 - 20 \* (6-N).

#### 4. additional points for relevant extracurricular qualifications or supplementary qualifications

Points are awarded for the additional extracurricular qualifications shown in the overview, which can be added to the result of the formula calculation. A maximum of 4 points can be included in the calculation. The commission decides on the recognition of the indicated relevant extracurricular qualifications or additional qualifications.

Type of additional qualification	Duration				
	Full-time (≥ 35 hrs/week)			Part-time	
	1-5 months	6-12 months	> 1 year	> 1 year	> 3 years
Education	0	2	4	2	4
Internship	1	2	3	2	3
MINT studies (TUM)	1				
Competition pursuant to § 5 para. 1 no. 3 sentence 1	1				

Issued on the basis of the resolution of the Academic Senate of Technische Universität München of 25 November 2020 and the approval by the President of Technische Universität München of 26 April 2021.

Munich, 26 April 2021

Munich University of Technology

Thomas F. Hofmann, Chairman

These bylaws were filed at the college on April 26, 2021; notice of the filing was posted at the college on April 26, 2021. The date of publication is therefore 26 April 2021.