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## **Academic and Examination Regulations for the Master's Degree Program Sustainable Management and Technology at the Technical University of Munich**

**dated 31 March 2021**

In accordance with Art. 13(1) Sentence 2 in conjunction with Art. 58(1) Sentence 1, Art. 61(2) Sentence 1 and Art. 43(5) of the Bavarian Higher Education Act [*Bayerisches Hochschulgesetz (BayHSchG)*] the Technical University of Munich issues the following Regulations:

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### **§ 34**

#### **Applicability, Academic Titles, Related Degree Programs**

- (1) <sup>1</sup>The Examination and Academic Regulations for the Master's Program in Sustainable Management and Technology (FPSO) complement the General Academic and Examination Regulations for Bachelor's and Master's programs at the Technical University of Munich (APSO) dated 18 March 2011 as amended. <sup>2</sup>The APSO shall have precedence.
- (2) <sup>1</sup>Upon successful completion of the master's examination, the degree "Master of Science" ("M.Sc.") is awarded. <sup>2</sup>The academic title may also be used with the name of the university ("TUM").
- (3) <sup>1</sup>The Master's Programs in Sustainable Management and Technology and in Bioeconomy at the Technical University of Munich are related degree programs. <sup>2</sup>If a student transfers from another university to the Technical University of Munich, the examination board in charge will decide on the basis of the examination/general academic regulations of that other university if the programs are related.

### **§ 35**

#### **Commencement of Studies, Standard Duration of Study, ECTS**

- (1) Admission to the Master's Program in Sustainable Management and Technology at the Technical University of Munich is possible both in the winter and in the summer semester.
- (2) <sup>1</sup>90 credits in elective subjects are needed to obtain the master's degree (55 weekly hours per semester) spread over three semesters. <sup>2</sup>In addition, 30 credits are given for completion of the master's thesis (in a maximum of six months) pursuant to § 46. <sup>3</sup>The number of coursework units and examinations in elective subjects to be completed in the Master's Program in Sustainable Management and Technology according to Appendix 1 is a minimum of 120 credits. <sup>4</sup>The standard duration of study for the master's program will be a total of four semesters.

### **§ 36**

#### **Eligibility Requirements**

- (1) Eligibility for the Master's Program in Sustainable Management and Technology is demonstrated by
  1. a qualified bachelor's degree obtained after a program of at least six semesters from a domestic or foreign institution of higher education, or an at least equivalent degree in Management and Technology, Bioeconomics, Business Management/Business Administration, Economics, or a comparable degree program,
  2. adequate knowledge of the English language; students whose native language or language of instruction is not English must demonstrate proficiency through an acknowledged language test such as the Test of English as a Foreign Language (TOEFL) (with a minimum of 88 points), the International English Language Testing System (IELTS) (with a minimum of 6.5 points), or the Cambridge Main Suite of English Examinations; if, in the undergraduate program, 15 credits were obtained for examinations administered in English-language examination modules, the thesis (at least 10 credits) was written in English, or a GMAT score of at least 600 is achieved, adequate proficiency in English is deemed proven.
  3. passing the Aptitude Assessment pursuant to Appendix 2.

- (2) A degree is considered a qualified degree within the meaning of Subsection 1 if there are no significant differences with regard to the competencies (learning outcomes) acquired in the scholarly oriented bachelor's programs specified in Subsection 1, No. 1, and if these outcomes correspond to the subject-specific requirements of the master's program.
- (3) For Aptitude Assessment in accordance with Subsection 2, the module catalog of the bachelor's degree program in Management and Technology will be considered.
- (4) The comparability of programs, subject-specific aptitude, as well as the equivalence of degrees acquired at foreign institutions will be decided upon by the Aptitude Assessment Commission in compliance with Art. 63 of the Bavarian Higher Education Act [*BayHSchG*].

### **§ 37**

#### **Modular Structure, Module Examination, Courses, Areas of Specialization, Language of Instruction**

- (1) <sup>1</sup>General provisions concerning modules and courses are set forth in §§ 6 and 8 of the APSO. <sup>2</sup>For any changes to the stipulated module provisions § 12(8) of the APSO shall apply.
- (2) The curriculum listing the required modules is included in Appendix 1.
- (3) <sup>1</sup>As a rule, the language of instruction in the master's program Sustainable Management and Technology is English. <sup>2</sup>In addition to English-language modules, some modules are offered in German. <sup>3</sup>Where the language of a module is specified as either English or German in Appendix 1, the examiner will authoritatively determine the actual language of instruction in a suitable manner prior to commencement of classes. <sup>4</sup>Students who have not verified their knowledge of German in the application process will be conditionally admitted with the stipulation that they complete at least one module in which they acquire integrative knowledge of German by the end of the second semester of enrollment in the degree program. <sup>5</sup>The offer will be announced by the Examination Board accordingly. <sup>6</sup>Optional achievements completed in extracurricular courses, e.g. German courses offered by the TUM Language Center, will also be recognized for credits earned.

### **§ 38**

#### **Examination Deadlines, Academic Progress Checks, Failure to Meet Deadlines**

- (1) Examination deadlines, academic progress checks, and failure to meet deadlines are governed by § 10 of the APSO.
- (2) <sup>1</sup>At least two of the module examinations from the electives listed in Appendix 1 under Fundamentals in Sustainable Management must be successfully completed by the end of the second semester. <sup>2</sup>In the event of failure to comply with this deadline § 10(5) of the APSO will apply.

### **§ 39**

#### **Examination Board**

Pursuant to § 29 of the APSO, the board responsible for decisions concerning examination matters in the master's degree program Sustainable Management and Technology shall be the Examination Board of the TUM School of Management.

## § 40

### Recognition of Periods of Study, Coursework, and Examination Results

The recognition of periods of study, coursework, and examination results is governed by § 16 of the APSO.

## § 41

### Continuous Assessment Procedure, Types of Assessment

- (1) <sup>1</sup>In addition to written examinations (*Klausuren*) and oral examinations, types of assessment pursuant to § 12 and § 13 of the APSO may include (but are not limited to) laboratory assignments, practical credit requirements (tests, where applicable), reports, project work, presentations, learning portfolios, research papers, or parcours examinations. <sup>2</sup>Details of each module examination and the competencies to be assessed in each examination are set out in the module descriptions. <sup>3</sup>Where the topic permits, the examination can be held either as an individual or group examination; § 18(2) Sentences 2 and 3 of the APSO apply accordingly.
- a) <sup>1</sup>A **Klausur** is a supervised written examination. In these written examinations, students are expected to demonstrate, within a limited amount of time and using predefined methods and resources, their ability to identify problems, find solution strategies and, if required, implement them. <sup>2</sup>The duration of *Klausuren* is provided for in § 12(7) of the APSO.
- b) <sup>1</sup>Depending on the discipline, **laboratory assignments** may include experiments, measurements, field work, field exercises, etc. with the goal of students conducting such work, evaluating results and gaining knowledge. <sup>2</sup>These may consist of, for example, process descriptions and the underlying theoretical principles including studying the relevant literature; preparation and practical implementation; calculations, if required, and documentation, evaluation, and interpretation of the results in the context of the knowledge to be gained. <sup>3</sup>Laboratory assignments may be complemented by presentations designed to demonstrate a student's communication competency in presenting scholarly work to an audience.
- c) **Practical credit requirements (tests where applicable)** involve students completing assigned tasks (for example, solving mathematical problems, writing computer programs, preparing models, preparing designs) using theoretical knowledge to solve application-oriented problems. <sup>2</sup>Practical credit requirements are designed to assess a student's factual and detailed knowledge and its application. <sup>3</sup>Practical credit requirements may be carried out in writing, orally, or electronically. <sup>4</sup>They may be in the form of homework assignments, practice sheets, programming exercises, (e-)tests, design tasks, posters, tasks assigned within a university internship program, etc.
- d) <sup>1</sup>A **report** is a written record and summary of a learning process for the purpose of presenting the acquired knowledge in a structured way and analyzing the results in the context of a module. <sup>2</sup>Students are expected to demonstrate that they have understood all essential aspects and are able to present them in writing. <sup>3</sup>Reports may include excursion reports, internship reports, work reports, etc. <sup>4</sup>The written report may be complemented by a presentation for the purpose of assessing the student's communication competency in presenting scholarly work to an audience.
- e) <sup>1</sup>**Project work** is designed to reach, in several phases (initiation, problem definition, role assignment, idea generation, criteria development, decision, implementation, presentation, written evaluation), the defined objective of a project assignment within a given period of time and using suitable instruments. <sup>2</sup>In addition, project work may include a presentation or a subject-specific discussion in order to assess a student's communication competency in presenting scholarly work to an audience. <sup>3</sup>It may also encompass design sketches, drawings, plans, models, objects, simulations or documentation.

- f) <sup>1</sup>A **research paper** is a written assignment in which students work independently on solving complex scholarly or scholarly/application-oriented problems, using the scientific methods of the relevant discipline. <sup>2</sup>Students are expected to demonstrate that they are able to solve problems corresponding to the learning results of the module in question in compliance with the guidelines for scholarly work – from analysis and conception to implementation. <sup>3</sup>Research papers, differing in their requirement standards, may take the form of a conceptual framework/theory paper [*Thesepapier*], abstract, essay, term paper, seminar paper, etc. <sup>4</sup>The research paper may be complemented by a presentation and/or a colloquium for the purpose of assessing the student's communication competency in presenting scholarly work to an audience.
- g) <sup>1</sup>A **presentation** is a systematic and structured oral performance supported by suitable audio-visual equipment (such as beamer, slides, posters, videos) for the purpose of demonstrating and summarizing specific issues or results and paring complex problems down to their essential core. <sup>2</sup>In the presentation, the student is expected to demonstrate that he or she is capable of preparing a certain topic within a given time frame in such a way as to present or report it in a clear and comprehensible manner to an audience. <sup>3</sup>In addition, the student is expected to demonstrate that he or she is able to respond competently to any questions, suggestions or discussions brought by the audience and relating to the subject area. <sup>4</sup>The presentation may be complemented by a brief written précis.
- h) <sup>1</sup>An **oral examination** is a timed, graded discussion on relevant topics and specific questions to be answered. <sup>2</sup>In oral examinations students are expected to demonstrate that they have understood the central concepts of the subject matter covered by the exam and are able to apply them to specific problems. <sup>3</sup>The duration of the examination is regulated in § 13(2) of the APSO.
- i) <sup>1</sup>A **learning portfolio** is a collection of completed work compiled by the student according to predefined criteria that exhibits the student's progress and achievements in defined content areas at a given time. <sup>2</sup>Students are required to explain the reasons for selecting the works included, their relevance for their learning progress and the achievement of the defined learning outcomes. <sup>3</sup>With the learning portfolio, students are expected to demonstrate that they have taken active responsibility for their learning process. <sup>4</sup>Depending on the module description, types of independent study assessment in a learning portfolio may include, in particular, application-oriented assignments, web pages, weblogs, bibliographies, analyses, conceptual framework/theory papers, as well as the graphic representation of facts or problems. <sup>5</sup>A subject-specific final oral discussion for the purpose of reflection and based on the content of the learning portfolio may also take place.
- j) <sup>1</sup>The **parcours examination** consists of several components. <sup>2</sup>Unlike a module examination component, parcours exam components are administered in sequence and completed in a specific time frame and location. <sup>3</sup>Parcours components entail various types of examination, which together evaluate the competency profile of the module as a whole. <sup>4</sup>Possible types of examination in parcours components may include those listed in g) and h) in combination with a practical requirement. <sup>5</sup>The total duration of the parcours examination with all its components is indicated in the module catalog.
- (2) <sup>1</sup>The module examinations will, as a rule, be taken concurrently with the degree program. <sup>2</sup>The type and duration of module examinations is stipulated in Appendix 1. <sup>3</sup>For any changes to the stipulated module provisions § 12(8) of the APSO shall apply. <sup>4</sup>The assessment of the module examination is governed by § 17 of the APSO. <sup>5</sup>The grade weights of module examination components correspond to the weighting factors assigned to them in Appendix 1.
- (3) At the request of the students and with the consent of the examiners, examinations for German-language modules may be taken in English.

## § 42

### Registration for and Admission to the Master's Examination

- (1) <sup>1</sup>Students who are enrolled in the master's program in Sustainable Management and Technology are deemed admitted to the module examinations of the master's examination.
- (2) <sup>1</sup>Registration requirements for required and elective module examinations are stipulated in § 15(1) of the APSO. <sup>2</sup>The registration requirements for repeat examinations for failed required modules are stipulated in § 15(2) of the APSO.

## § 43

### Scope of the Master's Examination

- (1) The master's examination consists of:
  1. the module examinations in the relevant modules pursuant to Subsection 2;
  2. the master's thesis pursuant to § 46
  3. and the coursework listed in § 45.
- (2) <sup>1</sup>The module examinations are listed in Appendix 1. <sup>2</sup>Students must select either a major in Biotechnology and Material Science or a major in Sustainable Management. <sup>3</sup>In both majors, students must complete 12 credits in elective modules in the area of Fundamentals in Sustainable Management and 18 credits in elective modules in the area of Specialization in Management. <sup>4</sup>Students who select a major in Biotechnology and Material Science must complete at least 30 credits in elective modules in the area Specialization in Engineering and Natural Sciences and at least 30 credits in elective modules in the area Electives in Management and Technology. <sup>5</sup>Students who select a major in Sustainable Management must complete at least 15 credits in elective modules in the area Specialization in Engineering and Natural Sciences and at least 45 credits in elective modules in the area Electives in Management and Technology. <sup>6</sup>The selection of modules must comply with § 8(2) of the APSO.

## § 44

### Repeat Examinations, Failed Examinations

- (1) The repetition of examinations is governed by § 24 of the APSO.
- (2) Failure of examinations is governed by § 23 of the APSO.

## § 45

### Multiple Choice Tests

The conduct of multiple choice tests is governed by § 12 a of the APSO.

## § 46

### Master's Thesis

- (1) <sup>1</sup>As part of the master's examination, each student must write a master's thesis pursuant to § 18 of the APSO. <sup>2</sup>The thesis topic may be determined and the master's thesis supervised by expert examiners of the TUM Campus Straubing for Biotechnology and Sustainability (*Themensteller/Themenstellerin*). <sup>3</sup>Expert examiners as stipulated in Sentence 2 are appointed by the Examination Board.

- (2) <sup>1</sup>Completion of the master's thesis module, as a rule, is the final examination requirement. <sup>2</sup>Upon request students may be granted early approval to commence work on the master's thesis if the objective of the thesis in the sense of § 18(2) APSO can be fulfilled under consideration of the progression of studies to date.
- (3) <sup>1</sup>The period of time between topic determination and submission of the completed thesis must not exceed 6 months. <sup>2</sup>The thesis is considered submitted and failed if the student fails to submit it on time without valid reasons as specified in § 10(7) of the APSO. <sup>3</sup>The master's thesis must be written in English.
- (4) <sup>1</sup>If the master's thesis module was not graded as at least "sufficient" (4.0), it may be repeated once with a new topic. <sup>2</sup>Students must renew their application to prepare the master's thesis module within six weeks of receipt of the grade.

### **§ 47**

#### **Passing and Assessment of the Master's Examination**

- (1) The master's examination is deemed passed when all examinations required for the master's examination in accordance with § 43(1) have been passed and a plus credits account of at least 120 credits has been achieved.
- (2) <sup>1</sup>The module grade will be determined according to § 17 of the APSO. <sup>2</sup>The overall grade for the master's examination will be calculated as the weighted grade average of the modules according to § 43(2) and the master's thesis module. <sup>3</sup>The grade weights of the individual modules correspond to the credits assigned to each module. <sup>4</sup>The overall assessment is expressed by the designation pursuant to § 17 of the APSO.

### **§ 48**

#### **Degree Certificate, Diploma, Diploma Supplement**

If the master's examination is passed, a degree certificate, a diploma and a diploma supplement including a transcript of records are to be issued in compliance with § 25(1) and § 26 of the APSO.

### **§ 49**

#### **Entry into Force**

<sup>1</sup>These regulations will enter into force on 1 April 2021. <sup>2</sup>They apply to all students who commence their studies at the Technical University of Munich as of the winter semester 2021/22.

**APPENDIX 1:****Examination Modules****Elective Module Fundamentals in Sustainable Management**

A total of 30 credits must be obtained in modules in this area of electives. Students must select modules totaling 12 credits in the area Research Methods and 18 credits in the area Specialization in Management. The modules in the area Fundamentals in Sustainable Management not selected in order to reach these 30 credits can be applied to the area Electives in Management and Technology.

No.	Module name	Type of instruction/ SWS V Ü P S	Sem.	SWS	Credits	Type of examination	Duration of examination; weighting factor	Language of instruction
<b>Research Methods</b>								
CS0096	Advanced Empirical Research Methods	2 V 2 Ü	WiSe	4	6	S & PP	60 1:1	English
CS0120	Advanced Sustainability and Life Cycle Assessment	2 V 2 Ü	SoSe	4	6	S	90	English
CS0098	Operations Research	4 VI	WiSe	4	6	S	90	English
No.	Module name	Type of instruction/ SWS V Ü P S	Sem.	SWS	Credits	Type of examination	Duration of examination; weighting factor	Language of instruction
<b>Specialization in Management</b>								
CS0060	Business Game in Sustainable Management	2 V 2 Ü	SoSe	4	6	PP		German or English
CS0113	Innovation in Bioeconomy	2 V 2 Ü	WiSe	4	6	S	90	English
CS0128	Corporate Sustainability Management	1 V 3 Ü	WiSe	4	6	S	90	German or English
CS0169	Sustainable Supply Chain Management	2 V 2 Ü	SoSe	4	6	S & PP	60 1:1	English
CS0121	Sustainable Production	2 V 2 Ü	WiSe	4	6	S	90	English
CS0174	Marketing for Biobased Products	2 V & S 2 PA	WiSe	4	6	M & PP (SL)	20	English



In the M.Sc. Sustainable Management and Technology, students must select either the major in Biotechnology and Material Science or the major in Sustainable Management as their area of concentration.

Students who select a major in Biotechnology and Material Science must complete at least 30 credits in elective modules in the area Specialization in Engineering and Natural Sciences and at least 30 credits in elective modules in the area Electives in Management and Technology.

Students who select a major in Sustainable Management must complete at least 15 credits in elective modules in the area Specialization in Engineering and Natural Sciences and at least 45 credits in elective modules in the area Electives in Management and Technology.

The modules in the area Specialization in Engineering and Natural Sciences not selected in order to reach the 15 credits in the major in Sustainable Management or the 30 credits in the major in Biotechnology and Material Science can be applied to the area Electives in Management and Technology.

The catalog of elective modules will be announced in good time before the beginning of classes in a suitable manner at the Campus Straubing for Biotechnology and Sustainability.

### **Elective modules *Specialization in Engineering and Natural Sciences:***

No.	Module name	Type of instruction	Sem.	SWS	Credits	Type of examination	Duration of examination; weighting factor	Language of instruction
		/						
		SWS V Ü P						
CS0102	Introduction to Game Theory*	4 VI	WiSe	4	5	M	25	German or English
CS0166	Environmental Resources in a Changing World*	4 V	WiSe	4	5	S	90	English
CS0100	Microbial and Plant Biotechnology	2 V 1 S 1 V	WiSe	4	6	S & S & PP (SL)	90, 60; 1:1	English
CS0012	Artificial Intelligence in Biotechnology	4 VI	WiSe	4	5	S	90	English
WZ1290	Biological Materials in Nature and Technology	4 V	SoSe	4	5	S	90	German or English
WZ1689	Basics of Numerical Methods and Simulation	4 VI	SoSe	4	6	S	90	German or English
CS0103	Bioinspired Materials and Processes	2 V 1 Ü	WiSe	3	5	M & PP (SL)	30	English
WZ1157	Sustainable Chemistry	2 V 1 S	SoSe	3	5	S & PP (SL)	60	English
CS0105	Modeling and Optimization of Energy Systems	4 VI	WiSe	4	6	S	90	German or English
CS0101	Renewables Utilization*	2 V 2 Ü	WiSe	4	5	S	90	English

CS0110	Enzyme Engineering	2 V 2 P	WiSe/SoSe	4	6	S & B	60; 2:1	English
CS0009	Enzymatic Biotransformations	2 V 2 Ü	WiSe	4	5	S	90	English
CS0086	Wood-based Resources*	2 V 2 Ü	WiSe	4	5	S	90	German or English
CS0026	Advanced Concepts of Bioinformatics	4 VI	SoSe	4	5	S	90	English
CS0134	Conceptual Process Design	2 V 2 Ü	WiSe	4	6	M	60	English
CS0003	Production of Alternative Fuels	2 V 2 Ü	WiSe	4	5	M	60	German or English
CS0170	Advanced Modeling and Optimization	2 V 2Ü	WiSe	4	7	PA & PA	1:1	German or English

**Elective modules *Electives in Management and Technology:***

No.	Module name	Type of instruction/SWS V Ü P	Sem.	SWS	Credits	Type of examination	Duration of examination; weighting factor	Language of instruction
CS0116	Markets for Energy and Biobased Products	3 V 1 Ü	SoSe	4	6	M & PP	20,30; 7:3	English
CS0125	Plant and Technology Management	2 V 2 Ü	SoSe	4	6	S	90	English
CS0126	Advanced Seminar in Circular Economy and Sustainability	4 S	WiSe	4	7	PP & W	30; 1:2	English
CS0123	Advanced Seminar in Behavioral Economics	4 S	WiSe	4	7	PP & W	30; 1:2	English
CS0112	Advanced Seminar in Supply and Value Chain Management	4 S	SoSe	4	7	PP & W	45; 1:1	English
CS0167	Advanced Seminar Finance & Accounting	4 S	SoSe	4	6	PP & W	25; 1.5:1	English
CS0171	Project Studies		1.-4. Sem.	8	12	PA		German or English

CS0172	Advanced International Experience	4 V	1.-4. Sem.	4	6	S	120	English
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### Master's Thesis

No.	Master's Thesis	Sem.	Credits	Language(s) of instruction
CS0173	Master's thesis	SoSe / WiSe	30 credits	English

### Explanations:

\* As specified in § 8(2) Sentence 3 of the APSO, students cannot apply these modules to the Master's Degree in Sustainable Management and Technology if they already completed them during their bachelor's studies.

Sem. = semester; SWS = Semesterwochenstunden/weekly hours per semester; V = Vorlesung/lecture; Ü = Übung/exercise; P = Praktikum/internship; WiSe = winter semester; SoSe = summer semester

S = Klausur/written exam; L = Laborleistung/laboratory assignment; M = mündlich/oral; PA = Projektarbeit/project work; PP = Präsentation/presentation; B = Bericht/report; W = Wissenschaftliche Ausarbeitung/research paper; ÜL = Übungsleistung/practical credit requirement; SL = Studienleistung/coursework

In the column "Duration of examination", the duration of written and oral examinations is specified in minutes.

### Credit total for each semester for students with the major in Biotechnology and Material Science:

Semester	Credits required modules	Credits elective modules	Credits Master's Thesis	Total Credits	Number of exams
1	12	18		30	5
2		30		30	5
3		30		30	5
4			30	30	1

### Credit total for each semester for students with the major in Sustainable Management:

Semester	Credits required modules	Credits elective modules	Credits Master's Thesis	Total Credits	Number of exams
1	12	18		30	5
2		30		30	5
3		30		30	5
4			30	30	1

## **APPENDIX 2: Aptitude Assessment**

### **Aptitude Assessment for the Master's Degree Program in Sustainable Management and Technology at the Technical University of Munich**

#### **1. Purpose of the Process**

<sup>1</sup>Eligibility for the Master's Degree Program in Sustainable Management and Technology, in addition to the requirements pursuant to § 36(1) Nos. 1 and 2, requires proof of aptitude pursuant to § 36(1) No. 3 in accordance with the following provisions. <sup>2</sup>The special qualifications and skills of the candidates should correspond to the field of Economics. <sup>3</sup>The individual aptitude parameters are:

- 1.1 specialist knowledge in the field of Business Management/Business Administration and Economics with a concentration in engineering or natural sciences from a bachelor's degree program comparable to the bachelor's program in Management and Technology at the Technical University of Munich;
- 1.2 knowledge of economic-technical problems;
- 1.3 ability to do research work and/or basic research and methodological work;
- 1.4 subject-specific language skills (in German and English) relating to engineering, natural sciences, and economics.

#### **2. Aptitude Assessment Process**

- 2.1 Aptitude assessment will be conducted semi-annually by the TUM School of Management.
- 2.2 <sup>1</sup>Applications for admission to the to the aptitude assessment process for the winter semester must be submitted to the Technical University of Munich together with the documents listed in 2.3.1. through 2.3.7. and in § 36(1) No. 2 no later than 31 May and for the summer semester by 30 November (absolute deadlines) using the online application procedure. <sup>2</sup>Official copies of the student's diploma and graduation certificate, serving as proof of the conferral of the bachelor's degree, must be submitted to the TUM Center for Study and Teaching – Admissions and Enrollment Office no later than five weeks after the first day of classes. <sup>3</sup>Admission to the master's program is, otherwise, not possible in accordance with § 36 of these regulations.
- 2.3 The application must include:
  - 2.3.1 a transcript of records containing modules amounting to at least of 140 credits; the transcript of records must be issued by the relevant examination authority or academic programs office,
  - 2.3.2 an online form giving an overview of academic achievements in which applicants compile their grades, credits, and weekly hours per semester for their examinations in the fundamental areas of Economics, Business Management/Business Administration, Quantitative Decision Support Applying Operations Research Methods, Empirical Methods, as well as Sustainability and Circular Economy (curricular analysis) including a curriculum on which the bachelor's degree program was based and which indicates the contents of the modules and the competencies gained (e.g., module catalog, module descriptions).
  - 2.3.3 a form listing the 140 credits for which applicants received their best grades in their bachelor's degree program;
  - 2.3.4 curriculum vitae formatted as a table;
  - 2.3.5 a 2000-word essay in English; the Chair of the Commission can assign one or more topics; applicants for the winter semester are to be notified of the topic by May 15, for the summer semester by November 15;
  - 2.3.6 a declaration that the essay is the applicant's own work, and that the applicant has clearly identified any ideas taken from outside sources.
  - 2.3.7 as appropriate, proof of a GMAT score of at least 600 points.

### 3. Aptitude Assessment Commission, Selection Committees

- 3.1 <sup>1</sup>Aptitude assessment is administered by the Aptitude Assessment Commission and the Selection Committees. <sup>2</sup>The Commission is responsible for preparing the aptitude assessment process, organizing it and ensuring a structured and standardized process for determining aptitude within the framework of these Regulations; it bears responsibility, insofar as no other body is specified by these Regulations or through delegation of its authority to another body. Selection Committees are to conduct the assessment process in accordance with Nr. 5 subject to Nr. 3.2 Sentence 11.
- 3.2 <sup>1</sup>The Commission consists of five members. Members of the Commission are appointed by the Dean, in consultation with the Study Dean, from among the authorized examiners of the School of Management and the Integrative Research Center TUM Campus Straubing for Biotechnology and Sustainability. <sup>3</sup>At least three commission members must be university educators within the meaning of the Bavarian Act on Higher Education Staff (BayHSchPG). <sup>4</sup>The Departmental Student Council has the right to name a student representative to serve on the Commission in an advisory capacity. <sup>5</sup>A deputy is to be appointed for each member of the Commission. <sup>6</sup>The Commission elects a chairperson and a deputy chairperson from among its members. <sup>7</sup>Procedures are governed Art. 30 of the TUM Charter as last amended. <sup>8</sup>The term in office of Commission members is 4 years. <sup>9</sup>Extensions of the term of office and reappointments are possible. <sup>10</sup>Urgent decisions that cannot be postponed can be made by the chairperson on behalf of the Commission; He/She must inform the Commission of such decisions without delay. <sup>11</sup>The Academic Programs Office supports the Commission and the Selection Committee; the Commission may delegate to the Office the task of assessing formal admissions requirements in accordance with Nr. 4, as well as the determination of points to be awarded based on defined criteria for which there is no freedom of discretion involved. This includes, in particular, the conversion of grades and the calculation of the overall points earned by the applicant. The Office may also be involved in choosing the members of the Selection Committee from among the commissioners and assigning them to applicants.
- 3.3 <sup>1</sup>Each Selection Committee consists of two members of the Integrative Research Center TUM Campus Straubing for Biotechnology and Sustainability, who are authorized to conduct examinations in the degree program according to Art. 62(1) Sentence 1 of the Bavarian Higher Education Act [BayHSchG] in conjunction with the act governing examiners at institutions of higher education [*Hochschulprüfverordnung*]. <sup>2</sup>At least one member must be a university educator within the meaning of the Bavarian Act on Higher Education Staff (BayHSchPG). <sup>3</sup>It is permissible to serve concurrently on both the Aptitude Assessment Commission and the Selection Committee. <sup>4</sup>Members of the Committee are appointed by the Commission for a term of 1 year; Nr. 3.2 Sentence 9 applies accordingly. <sup>5</sup>Different Selection Committees may be assigned to individual criteria and stages of the assessment process.

### 4. Admission to the Aptitude Assessment Process

- 4.1 Admission to the aptitude assessment process requires that all documentation specified in No. 2.2 has been submitted in a timely and complete fashion.
- 4.2 <sup>1</sup>Applicants who have fulfilled the requirements according to No. 4.1 will be assessed according to No. 5. <sup>2</sup>Applicants not suited the program will receive a letter of rejection stating the grounds for rejection and informing them of legal remedies.

### 5. The Aptitude Assessment Process

#### 5.1 First Stage

- 5.1.1 <sup>1</sup>The commission will assess, on the basis of the written application documents required under no. 2.3, whether or not an applicant is suitable for a program pursuant to no. 1 (First stage of the aptitude assessment process). -
- 5.1.2 <sup>2</sup>The candidate's application documents will be evaluated on a scale ranging from 0 to 89 points, 0 being the worst and 89 the best possible result:

The following criteria will be applied to the evaluation:

### a) Discipline-Specific Skills and Qualifications

<sup>1</sup>The curricular analysis is conducted on the basis of competencies, rather than a schematic comparison of modules. <sup>2</sup>The analysis is based on the fundamental core module groups listed in the following table of the bachelor's program in Management and Technology at the Technical University of Munich.

Core module group	Assessment (in points) Number of points
Business management modules, at least 20 credits	<b>20</b>
Economics modules, at least 10 credits	<b>10</b>
Discipline-specific fundamentals in the area of quantitative decision support applying Operations Research methods, at least 5 credits	<b>5</b>
Discipline-specific fundamentals in the area of empirical methods, at least 5 credits	<b>5</b>
Discipline-specific fundamentals in the area of Sustainability and Circular Economy, at least 10 credits	<b>10</b>
<b>Total</b>	<b>50</b>

<sup>3</sup>If it is established that there are no significant differences in the competencies acquired (learning outcomes), a maximum of 50 points will be awarded. <sup>4</sup>If this value is not a whole number, it will be rounded up. <sup>5</sup>If competencies are lacking, 0 points will be given for the group type in question.

### b) Grade

<sup>1</sup>The applicant will be awarded one point for each 2/10 that the average calculated from examinations in the amount of 140 credits is better than 2.7. <sup>2</sup>The maximum number of points is 9. <sup>3</sup>Negative points will not be awarded. <sup>4</sup>Grades of international degrees will be converted by applying the Bavarian formula. <sup>5</sup>If the candidate has submitted a degree certificate containing more than 140 credits with the application, the assessment will be made on the basis of the modules with the best grades amounting to 140 credits. <sup>6</sup>The applicant needs to submit a list of the results together with the application and confirm its accuracy in writing. - <sup>7</sup>If the candidate submits this list, the average is calculated from graded module examinations with the best grades amounting to 140 credits; if no list is submitted, the overall average of grades submitted by the candidate will be used to calculate the average. <sup>8</sup>The overall grade average is calculated as a weighted grade average. <sup>9</sup>The grade weights of the individual modules correspond to the credits assigned to each module.

### c) Essay

<sup>1</sup>The written essay must be no longer than eight pages (incl. cover sheet, figures, table of contents, and bibliography). <sup>2</sup>The essay will be evaluated by Committee member and graded on a scale of 0 to 20 points. <sup>3</sup>The content will be assessed using the following criteria:

Applicants should be able

1. to present scientific-logical argumentation skills in a text structured according to the fundamentals and methods of their discipline and to write the essay in an appropriately scientific manner, indicating sources correctly;
2. to place the research question within the context of economic-technical problems;
3. to express themselves in English.

<sup>4</sup>Commission members independently assess each of the criteria, weighting them as follows:

1. presenting scientific-logical argumentation skills in a text structured according to the fundamentals and methods of the discipline and writing the essay in an appropriately scientific manner, indicating sources correctly: a maximum of 10 points;

2. placing the research question within the context of economic-technical problems: a maximum of 5 points;
3. ability to express themselves in English: a maximum of 5 points.

<sup>5</sup>The score per Committee member is calculated as the sum of the weighted scores for each criterion. <sup>6</sup>The overall point total awarded by both Committee members will be calculated as the arithmetic mean of their individual assessments, rounded up to the nearest full point. <sup>8</sup>The maximum number of points is 20.

#### **d) GMAT Score**

Proof of a GMAT score of at least 600 points will be assessed with 10 points.

- 5.1.2 <sup>1</sup>The points total in the first stage will be calculated as the sum of the individual evaluations. -
- 5.1.3 <sup>1</sup>Applicants with at least 59 points will be deemed suitable. <sup>2</sup>In those cases where it is determined that only individual subject-specific requirements are missing from undergraduate studies, the Selection Committee may require that applicants complete fundamentals exams from the bachelor's degree program in Management and Technology (TUM-BWL) with the technical area of concentration Renewable Resources amounting to a maximum of 30 credits. <sup>3</sup>These fundamentals exams must be successfully completed in the first year of study. <sup>4</sup>Failed fundamentals exams may be repeated only once and at the next examination date.
- 5.1.4 Applicants who have achieved less than 52 points fail the aptitude assessment..

#### **5.2 Second Stage:**

- 5.2.1 <sup>1</sup>The remaining applicants will be invited to an aptitude assessment interview. <sup>2</sup>During the second stage of the aptitude assessment, both skills acquired during the applicant's bachelor's studies and the result of the assessment interview will be assessed. <sup>3</sup>Interview appointments will be announced at least one week in advance. <sup>4</sup>Time slots for interviews must be scheduled before expiration of the application deadline. <sup>5</sup>The interview appointment must be kept by the applicant. <sup>6</sup>Conducting the aptitude assessment interview via video conference is possible upon a student's well-founded request. <sup>7</sup>The applicant bears the risk in the event of any technical problems, unless these are attributable to the Technical University of Munich. <sup>8</sup>If the applicant is unable to attend an aptitude assessment interview due to reasons beyond his/her control, a later appointment may be scheduled upon a student's well-grounded request, but no later than two weeks before the beginning of classes.
- 5.2.2 <sup>1</sup>The aptitude assessment interview is to be held individually for each applicant. <sup>2</sup>The interview lasts at least 20 but not more than 30 minutes for each applicant. <sup>3</sup>The interview will focus on the following topics:
1. exceptional motivation for and commitment to the master's degree program in Sustainable Management and Technology according to the following criteria:
    - a. explanation by the applicant of the specific abilities and interests that make him/her particularly qualified for the master's degree program in Sustainable Management and Technology at the Technical University of Munich;
    - b. the applicant's exceptional motivation for and commitment is to be demonstrated, for example by providing details on program-related vocational training, internships, stays abroad, or program-related further education beyond the attendance and course requirements of the bachelor's program;
  2. basic and application-related questions in subjects in mathematics as well as engineering and the natural sciences, each in relation to economics, to assess the applicant's disciplinary qualifications;
  3. ability to communicate in English.
    - a. The applicant is able to express him/herself comprehensibly in English and can explain topics relevant to the subject precisely;
    - b. statements are reasoned convincingly by using arguments and meaningful examples;
    - c. questions about the bachelor's degree program are answered using exact terminology and comprehensible reasons are given.

<sup>4</sup>The above topics may cover the documentation submitted pursuant to 2.3. <sup>5</sup>Any subject-specific academic knowledge that is to be taught in the master's degree program Sustainable Management and Technology will not affect the decision. <sup>6</sup>With the applicant's approval, a representative of the student body may sit in on the interview.

5.2.3 <sup>1</sup>Committee members independently assess each of the three areas with equal weighting. <sup>2</sup>Each member of the Committee will grade the result of the interview on a scale from 0 to 50, 0 being the worst and 50 being the best possible result. <sup>3</sup>The points total will be calculated as the arithmetic mean of the individual evaluations. <sup>4</sup>Non-vanishing decimal places must be rounded up.

5.2.4 <sup>1</sup>The total number of points awarded in stage 2 is the sum of the points from 5.2.3 and the points from 5.1.1 letter a) (subject-specific qualification) and 5.1.1 letter b) (overall grade). <sup>2</sup>Applicants with 70 or more points will be deemed suitable. <sup>3</sup>Applicants with an overall grade of less than 70 points have failed the aptitude assessment.

### 5.3 Determination and Notification of Results

<sup>1</sup>Applicants will be informed of the results of the aptitude assessment through official notification.

<sup>2</sup>Applicants not suited for the program will receive a letter of rejection stating the grounds for rejection and informing them of legal remedies.

5.4 Candidate's suitability for the program, once determined in aptitude assessment, applies to all subsequent applications for this program.

## 6. Record

<sup>1</sup>The aptitude assessment process must be documented, in particular the names of the participating members of the Selection Committee, the evaluation of the first and second stages, as well as the overall results. <sup>2</sup>The aptitude assessment interview must be documented, including the date, duration and location of the assessment, the names of the participating Selection Committee members, the applicant's name, and a list of main topics of discussion in bullet points.

## 7. Repeat Aptitude Assessments

Applicants who have failed an aptitude assessment may apply once to repeat the aptitude assessment process.

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Executed following a resolution of the Senate of the Technical University of Munich dated 25 November 2020 and approval of the President of the Technical University of Munich dated 31 March 2021.

Munich, 31 March 2021

Technical University of Munich

Thomas F. Hofmann President

These Regulations were made available for inspection at the Technical University of Munich on 31 March 2021, following their announcement on 31 March 2021. Day of proclamation shall therefore be 31 March 2021.