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## **Academic and Examination Regulations for the Bachelor's Degree Program Aerospace at the Technical University of Munich**

**Dated 26 April 2021  
as amended by the Amending Statute of 3 September 2021**

In accordance with Art. 13(1) Sentence 2 in conjunction with Art. 58(1) Sentence 1 and Art. 61(2) Sentence 1 of the Bavarian Higher Education Act (*BayHSchG*), the Technical University of Munich issues the following regulations:

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## I. General Rules

### § 34

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

- (1) <sup>1</sup>These program-specific Academic and Examination Regulations (*FPSO*) complement the General Academic and Examination Regulations for Bachelor's and Master's Degree Programs at the Technical University of Munich (*APSO*) dated 18 March 2011 as amended. <sup>2</sup>The *APSO* has precedence.
- (2) <sup>1</sup>Upon successful completion of the Bachelor's examination, the degree "Bachelor of Science" ("B.Sc.") is awarded. <sup>2</sup>The academic title may also be used with the name of the university "(TUM)".
- (3) <sup>1</sup>There is no other degree program related to the Bachelor's Degree Program Aerospace at the Technical University of Munich. <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 Study, Standard Duration of Study, ECTS

- (1) The start of the Bachelor's Degree Program Aerospace is regulated by § 5 of the General Academic and Examination Regulations (*APSO*).
- (2) <sup>1</sup>The number of credits in required and elective subjects needed to obtain the Bachelor's degree is 168 credits (135 SWS). <sup>2</sup>Twelve credits are also awarded for the Bachelor's Thesis. <sup>3</sup>In accordance with Appendix 1, the scope of coursework and examination requirements in required and elective subjects to be completed in the Bachelor's Degree Program Aerospace is a minimum of 180 credits. <sup>4</sup>The standard duration of study for the bachelor's program is a total of six semesters.

### § 36

#### Eligibility Requirements

- (1) For the Bachelor's Degree Program Aerospace, the general admission requirements for studying at a university must be met in accordance with the regulation on qualifications for studying at higher education institutions in the state of Bavaria and the state-approved, non-public institutions of higher education (Qualification Regulation-*QualV*) (*BayRS 2210-1-1-3-K/WK*) as last amended.
- (2) Furthermore, proof of aptitude is required in accordance with the regulations on aptitude assessment for the Bachelor's Degree Program Aerospace dated 26 April 2021.
- (3) <sup>1</sup>Prior to starting the program, proof is also required that the student has completed at least eight weeks of relevant practical work related to the specific discipline. <sup>2</sup>Proof must be submitted by means of a qualified internship certificate or a report from the internship company or institution confirming an internship was completed there. <sup>3</sup>Proof must be submitted prior to the start of the degree program but no later than four weeks before the end of the second semester of enrollment in the degree program. <sup>4</sup>The type and

scope of the internship are regulated in Appendix 3: Guidelines for the Industrial Internship.

- (4) <sup>1</sup>If the language of instruction is not German, proof of basic knowledge of the German language must be presented. <sup>2</sup>Proof of this language requirement can be met by a generally recognized language test such as the *Goethe-Zertifikat* (level A2), *telc* (level A2) or the DSH-Test (DSH-1).

### **§ 37**

#### **Modular Structure, Course Offerings, Language of Instruction**

- (1) <sup>1</sup>General regulations concerning modules and course offerings are set forth in §§ 6 and 8 of the General Academic and Examination Regulations (*APSO*). <sup>2</sup>For any changes to the stipulated module provisions § 12(8) of the *APSO* applies.
- (2) The curriculum and a list of the modules to be completed in the required and elective subjects are included in Appendix 1.
- (3) <sup>1</sup>As a rule, the language of instruction in the Bachelor's Degree Program Aerospace is English. <sup>2</sup>Applicants should thus have very good knowledge of the English language. <sup>3</sup>Appendix 1 includes details on whether the individual modules for elective subjects are offered in German or English. <sup>4</sup>The examiners will announce the binding language of instruction in a suitable manner at the latest by the first day of classes.

### **§ 37 a**

#### **Industrial Internship**

- (1) <sup>1</sup>Within the scope of the research practice module "Engineering Internship", a specialized internship must be completed as a coursework requirement within the meaning of § 6(7) of the General Academic and Examination Regulations (*APSO*). <sup>2</sup>Internship period must last for at least six weeks (8 credits). <sup>3</sup>Successful participation is to be confirmed by the company or institution where the internship was completed and with internship reports. <sup>4</sup>The type and scope of the internship are regulated in Appendix 3: Guidelines for the Industrial Internship.
- (2) <sup>1</sup>Alternatively, a project seminar can also be completed with a TUM Chair within the scope of a research practice module if there are places offered. <sup>2</sup>The project seminar also covers a period of six weeks (8 credits). <sup>3</sup>Successful participation is substantiated with a project paper.
- (3) <sup>1</sup>The research practice module "Engineering Internship" is determined and supervised by expert examiners (thesis supervisor) within the meaning of the General Academic and Examination Regulations (*APSO*). <sup>2</sup>Expert examiners are university educators in the TUM Department of Aerospace and Geodesy. <sup>3</sup>Anyone who offers modules in the Aerospace bachelor's program can also be a thesis supervisor.
- (4) The Examination Board is responsible for making decisions concerning the recognition of successfully completed vocational education and training or equivalent work as practical occupational training.

### § 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 General Academic and Examination Regulations (*APSO*).
- (2) <sup>1</sup>The required modules “Basic Mathematics” and “Engineering Mechanics I - Statics” must be successfully completed by the end of the second semester. <sup>2</sup>A module examination that was not passed in accordance to Sentence 1 can be retaken within the period indicated there. <sup>3</sup>In the event of failure to comply with this deadline, § 10(5) of the *APSO* applies.

### § 39

#### Examination Board

In accordance with § 29 of the General Academic and Examination Regulations (*APSO*), the board responsible for all decisions concerning examination matters is the Examination Board Aerospace of the TUM Department of Aerospace and Geodesy.

### § 40

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

The recognition of periods of study, coursework requirements and examination requirements are governed by § 16 of the *APSO*.

### § 41

#### Continuous Assessment Procedure, Types of Assessment

- (1) In addition to written and oral examinations, the types of assessment in accordance with § 12 and § 13 of the *APSO* may include (but are not limited to) laboratory assignments, exercises (tests where applicable), reports, project work, presentations, learning portfolios and research papers.
  - a) <sup>1</sup>A **written examination** is a supervised examination, in which 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 written examinations is specified 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.; they have the goal of students conducting such lab work, evaluating results, and gaining knowledge. <sup>2</sup>These may consist of, for example, process descriptions and 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. <sup>4</sup>Details of each laboratory assignment and the related competencies to be examined are set out in the module descriptions.

- c) <sup>1</sup>**Practical credit requirements (tests where applicable)** involve students completing assigned tasks (for example, solving mathematical problems, writing computer programs, preparing models, etc.) 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>This may be in the form of homework, exercise sheets, programming exercises, (digital) tests, tasks within the scope of higher education internships etc. <sup>5</sup>The specific parts of the respective practical credit requirements and the competencies to be examined are listed in the module description.
- 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 in order to assess a student's communication competency in presenting scholarly work to an audience. <sup>3</sup>Details on the respective project work and the related competencies to be examined are set out in the module descriptions. <sup>4</sup>The project work may also be in the form of group work. <sup>5</sup>Group work should demonstrate that the tasks can be solved in a team. <sup>6</sup>Each contribution to be assessed as an examination requirement must be clearly individually recognizable and assessable. <sup>7</sup>This also applies to the individual contribution to the group results.
- 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 related 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, abstract, term paper, seminar paper, etc. <sup>4</sup>A 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. <sup>5</sup>Details on the respective research paper and the related competencies to be examined are set out in the module descriptions.
- g) <sup>1</sup>A **presentation** is a systematic and structured oral performance supported by suitable audio-visual equipment (such as projector, 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>For 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 that relate to his or her subject area. <sup>4</sup>The presentation may be complemented by a brief written précis. <sup>5</sup>The

presentation can be given by one individual or as a group. <sup>6</sup>Each contribution to be assessed as an examination requirement must be clearly individually recognizable and assessable. <sup>7</sup>This also applies to the individual contribution to the group results.

- h) <sup>1</sup>A **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 achieved the qualification goals documented in the module descriptions; they have understood the central concepts of the subject matters covered by the exam; and they are able to apply them to specific problems. <sup>3</sup>The oral exam can be taken as an individual examination or as a group examination. <sup>4</sup>The duration of the examination is regulated in § 13(2) of the General Academic and Examination Regulations (*APSO*).
- i) <sup>1</sup>A **learning portfolio** is a collection of completed written 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 why they chose the work they have and its relevance for their learning progress and the achievement of the defined qualification goals. <sup>3</sup>The learning portfolio should demonstrate that responsibility was assumed for the learning process and the qualification goals documented in the module description. <sup>4</sup>Depending on the module description, the 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>Details on the respective learning portfolio and the related competencies to be examined are set out in the module descriptions.
- j) <sup>1</sup>The **parcours examination** is made up of several components within one examination requirement. <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 formats, which together evaluate the competency profile of the module as a whole. <sup>4</sup>Parcours components can also be types of examinations according to letters a) to i). <sup>5</sup>The total duration of the examination is to be indicated in the module catalog, and the type of examination and the time allotted to individual examination components are to be indicated in the module description.
- (2) <sup>1</sup>As a rule, module examinations are taken concurrently with the degree program. <sup>2</sup>The type and duration of module examinations are stipulated in Appendix 1. <sup>3</sup>For any changes to the stipulated module provisions, § 12(8) of the General Academic and Examination Regulations (*APSO*) applies. <sup>4</sup>The assessment of the module examinations is governed by § 17 of the *APSO*.
- (3) Where Appendix 1 provides that a module examination is either in written or oral form, the examiner will inform students officially and in appropriate form, no later than the first day of classes, of the type of examination to be held.
- (4) <sup>1</sup>At the request of the students and with the consent of the examiners, examinations for course offerings in English may be taken in German. <sup>2</sup>Similarly, examinations for course offerings in German can also be taken in English upon request.

### § 41 a Multiple Choice Tests

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

## **§ 42 Coursework Requirements**

In addition to the examination requirements indicated in § 45(1), the scope of the bachelor's examination includes successful completion of coursework requirements in the modules in accordance with Appendix 1 for a total of 11 credits, as well as a coursework requirement in the research practice module "Engineering Internship" in accordance with § 37 a).

## **§ 43 Registration for and Admission to Examinations**

- (1) Students who are enrolled in the Bachelor's Degree Program Aerospace are deemed admitted to the module examinations of the bachelor's examination.
- (2) <sup>1</sup>Registration for an examination requirement in a required or elective module is governed by § 15(1) of the General Academic and Examination Regulations (*APSO*). <sup>2</sup>The registration requirements for repeat examinations for failed required modules are stipulated in § 15(2) of the *APSO*.
- (3) <sup>1</sup>Contrary to (2) above, students are deemed as registered in the first semester for the module examinations named in § 38(2) for the required modules of "Basic Mathematics" and "Engineering Mechanics I", which are mandatory for the Bachelor's degree in Aerospace. <sup>2</sup>In the event a student is not present at an exam date, the module examination is deemed taken and failed if there is not a valid reason for the absence in accordance with § 10(7) 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*.

## **II. Bachelor's Examination**

### **§ 45 Scope of the Bachelor's Examination**

- (1) The bachelor's examination consists of:
  1. The module examinations in accordance with § 45(2);
  2. The bachelor's thesis in accordance with § 46; and
  3. The coursework requirements listed in § 42.
- (2) <sup>1</sup>Module examinations are listed in Appendix 1. <sup>2</sup>109 credits must be earned in required modules and at least 40 credits in elective modules. <sup>2</sup>The selection of modules must comply with § 8(2) of the General Academic and Examination Regulations (*APSO*).

- (3) <sup>1</sup>If an elective module listed in the Appendix cannot be offered, § 8(3) of the *APSO* shall apply. <sup>2</sup>Section § 17(5) Sentences 6 to 8 of the *APSO* applies to the determination of the elective modules.

## **§ 46 Bachelor's Thesis**

- (1) As part of the bachelor's examination, each student must write a bachelor's thesis in accordance with § 18 of the General Academic and Examination Regulations (*APSO*).
- (2) <sup>1</sup>Students will be approved for the bachelor's thesis who have achieved at least 120 credits, of which at least 99 credits must come from passed modules from the required module area in accordance with Appendix 1. <sup>2</sup>Students must commence work on their bachelor's thesis no later than six weeks after receiving notice of "Approval to Commence Bachelor's Thesis". <sup>3</sup>Any student who meets the admission requirements in accordance with Clause 1, will be approved to commence the bachelor's thesis by the Examination Board once a request for approval is made. <sup>4</sup>Upon receiving a positive notice of approval, the bachelor's thesis will be determined and supervised by an expert examiner (thesis supervisor) in accordance with Section 1.
- (3) <sup>1</sup>The scope of work for the bachelor's thesis is three months. <sup>2</sup>The period of time between determining a topic and submission of the bachelor's thesis may not exceed 6 months. <sup>3</sup>The bachelor's thesis is considered presented and not passed if a student fails to submit it on time without an approved valid reason as specified in § 10(7) of the *APSO*. <sup>4</sup>Twelve credits are awarded to a passed bachelor's thesis. <sup>5</sup>The bachelor's thesis can be written in either the German or English language.
- (4) <sup>1</sup>The completion of the bachelor's thesis consists of an academic research paper and a presentation on its content. <sup>2</sup>The presentation does not affect the grading.
- (5) <sup>1</sup>If the bachelor's thesis was not graded with at least "sufficient" (4.0), it may be repeated once with a new topic. <sup>2</sup>Students must renew their application to take the Bachelor's Thesis module again within six weeks of receiving their grade.

## **§ 46 a Additional Examinations**

- (1) <sup>1</sup>When students have at least 150 credits in their credits account, module examinations from the Master's program in Aerospace can be taken as additional examinations starting in the sixth semester of enrollment in the bachelor's degree program. <sup>2</sup>Failed additional examinations cannot be repeated within the scope of the bachelor's degree.
- (2) <sup>1</sup>The results of the additional examinations are not included in the overall grade for the bachelor's examination and are not recorded in the bachelor's degree certificate. <sup>2</sup>However, the additional examinations are recorded in the transcript of records with the grades achieved.

## **§ 47 Passing and Assessment of the Bachelor's Examination**



- (1) The bachelor's examination is deemed passed when all examinations required for the bachelor's examination have been passed in accordance with § 45 and a student has at least 180 credits in their credits account.
- (2) <sup>1</sup>The grade for the module will be determined according to § 17 of the General Academic and Examination Regulations (*APSO*). <sup>2</sup>The overall grade of the bachelor's examination is calculated using a weighted grading method in accordance with § 45(2) and the bachelor's thesis, whereby the thesis is weighted with a factor of 2 in addition to being weighted with 12 credits. <sup>3</sup>The grade weights of other modules correspond to the credits assigned to each module. <sup>4</sup>The overall assessment is expressed by the designation according to § 17 of the *APSO*.

### **§ 48**

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

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

### **III. Final Provision**

#### **§ 49**

#### **Entry into Force\*)**

<sup>1</sup>These regulations will enter into force on 15 May 2021. <sup>2</sup>They apply to all students who commence their studies at the Technical University of Munich in the winter semester 2021/2022.

\*) This provision concerns the entry into force of the regulations in their original version dated 26 April 2021. The point in time when the changes come into force are based on the amending statute.

**APPENDIX 1: Examination Modules****REQUIRED MODULES**

Module No.	Module name	Type of instruction SWS	Sem.	SWS	Credits	Type of examination	Duration of exam	Weighting f	Language of Instruction
MA9801	Basic Mathematics	5V, 2Ü	1	7	8	Written Exam	90		English
LRG0010	Engineering Mechanics I - Statics	3V, 4Ü	1	7	6	Written Exam	90		English
LRG0060	Computational Foundations I	2V, 1Ü	1	3	5	Written Exam	90		English
LRG0020	CAD/TD for Aerospace Engineers	2V, 1Ü	1	3	3	Written Exam	90		English
LRG0040	Aerospace Materials Science and Processing	4V, 2Ü	1+2	6	7	Written Exam	90		English
LRG0080	Electrical Engineering	4V, 2Ü	1+2	6	7	Written Exam	90		English
MA9802	Differential and Integral Calculus	5V, 2Ü	2	7	8	Written Exam	90		English
LRG0011	Engineering Mechanics II - Structural Mechanics Modeling	2V, 4Ü	2	6	5	Written Exam	90		English
LRG0061	Computational Foundations II	2V, 1Ü	2	3	5	Written Exam	60		English
LRG0030	Thermodynamics I	2V, 4Ü	2	6	5	Written Exam	90		English
MA9803	Modeling and Simulation with Ordinary Differential Equations	3V, 2Ü	3	5	5	Written Exam	60		English
LRG0012	Engineering Mechanics III – Dynamics	2V, 4Ü	3	6	5	Written Exam	90		English
LRG0031	Thermodynamics II	2V, 1Ü	3	3	5	Written Exam	90		English
LRG0070	Fluid Mechanics I	3V, 1Ü	3	4	6	Written Exam	90		English
LRG0050	Aerospace Structures and Elements	4V, 4Ü, 2P	3+4	10	9	Written Exam	90		English
MW1410	Heat Transfer	2V, 1Ü	4	3	5	Written Exam	90		English
LRG0071	Fluid Mechanics II	2V, 1Ü	4	3	5	Written Exam	90		English
LRG0081	Automatic Control Engineering	3V, 2Ü	4	5	5	Written Exam	90		English
LRG0090	Test, Analysis, and Simulation	2V, 1Ü	4	3	5	Written Exam	90		English
	<b>Total:</b>				<b>109</b>				

**BACHELOR'S THESIS**

LRG0005	Bachelor's Thesis		6	-	12	Research Paper			
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**ELECTIVE MODULES:**

The Examination Board regularly updates the elective modules course catalog. Any changes will be communicated on TUMonline no later than at the beginning of the semester.

**a) Engineering Elective Modules**

A total of at least 20 credits must come from the engineering elective modules. It must be ensured that in the area of engineering elective modules, at least two of these three subjects are covered by at least one module: systems, dynamics and propulsion. Furthermore, at least one module must be successfully completed from the system elective catalog and modeling elective catalog. The modules serve as examples and are regularly updated by the Examination Board.

Module No.	Module name	Type of instruction SWS	Sem.	SWS	Credits	Type of examination	Duration of exam	Weighting Factor	Language of Instruction
<b>System Elective (at least 1 module)</b>									
LRG0100	Aircraft Design Basics	2V, 1Ü	4	3	5	Written Exam	90		English
LRG0101	Rotorcraft and VTOL Design Basics	2V, 1Ü	4	3	5	Written Exam	90		English
LRG0102	Basics of Aerospace Propulsion Systems	2V, 1Ü	4	3	5	Written Exam	90		English
LRG0103	Basics in Space Technology	2V, 1Ü	4	3	5	Written Exam	90		English
	...								
<b>Modeling Elective (at least 1 module)</b>									
LRG0110	Computational Aerodynamics	2V, 1Ü	5	3	5	Written Exam	90		English
LRG0111	Computational Solid Mechanics in Aerospace	2V, 2Ü	5	4	5	Written Exam	90		English
LRG0112	Dynamic simulation for vehicles, machines and mechanisms	2V, 1Ü	5	3	5	Written Exam Project work (2:1)	60		English
LRG0113	Systems Theory and Modeling	2V, 1Ü	5	3	5	Written Exam	90		English
	...								
<b>Optional Engineering Electives</b>									
MW2462	Fundamentals of Additive Manufacturing	2V, 1Ü	5	3	5	Written Exam	90		English or German
	...								

**b) Engineering Supplementary Courses:** At least 6 credits must come from the area of supplementary courses. Alternatively, these 6 credits can also come from the electives catalog of the engineering elective modules if they have not been selected from there yet.

Module No.	Module name	Type of instruction SWS	Sem.	SWS	Credits	Type of examination	Duration of exam	Language of Instruction
MW2445	Machine Learning Based Modeling in Structural Dynamics	2V	6	2	3	Written Exam	60	English or German
MW2461	Machine Learning and Uncertainty Quantification for Physics-Based Models	2V	5	2	3	Presentation	60	English
	...							

- c) **Open Elective Modules:** Within the scope of the open elective modules, 5 credits can be freely selected, including from the interdisciplinary courses of study offered at TUM and from modules in other TUM schools or departments or in other higher education institutions.

### COURSEWORK REQUIREMENTS

The following modules are to be completed as part of the coursework requirements. The content of the Engineering Project module will be disclosed on the Examination Board's internet page in a timely manner at the start of the semester.

LRG0200	Introduction to Aerospace	2V	1	2	3	Report (SL)	-	English
LRG0201	Introduction to Geodesy and Geoinformation	2V	3	2	3	Report (SL)	-	English
LRG0202	Engineering Project	2P	5	2	5	Report (SL)	-	English
	<b>Total:</b>				<b>11 credits</b>			

### RESEARCH PRACTICE - Aerospace Lab Courses

At least 9 credits must be achieved in this area. This includes the requirement to take one module from the catalog Aerospace Lab Course I and one module from the catalog Aerospace Lab Course II. The modules in the catalog Aerospace Lab Course II are also offered in cooperation with other TUM schools/departments and are updated by the Examination Board on an ongoing basis.

Module No.	Module name	Type of instruction SWS	Sem.	SWS	Credits	Type of examination	Duration of exam	Language of Instruction
<b>Aerospace Lab Course I</b>								
LRG0120	Design / Build / Fly	4P	5	4	5	Laboratory assignment		English or German
LRG0121	Helicopter Lab Course	4P	5	4	5	Laboratory assignment		English or German
LRG0122	Testing of UAV Systems	4P	5	4	5	Laboratory assignment		English or German
	...							
<b>Aerospace Lab Course II</b>								
MW2381	Aerospace Electronics Practical Course	4P	6	4	4	Laboratory assignment		German
MW1068	Composite Construction Methods - Practical Course	4P	6	4	4	Report		English or German
	...							

### COURSEWORK REQUIREMENT - RESEARCH PRACTICE - Engineering Internship

One module of 8 credits must be taken from the following list. The engineering internship covers either one 6-week industrial internship (specialized internship) or practical project work for a TUM chair if places are available.

LRG0006	Engineering Internship	P	5		8	Report (SL)		English or German
LRG0007	Project Seminar	7S	5	7	8	Project work (SL)		English or German

#### Explanations:

Sem. = semester; SWS = weekly hours per semester; V = lecture; Ü = exercise module; P = practical course (internship); S = seminar; SL = coursework requirement  
The amount of time for the examination is specified in minutes in the column for examination duration.

**Appendix 2: Degree Chart**

1st Semester (Winter)	2nd Semester (Summer)	3rd Semester (Winter)	4th Semester (Summer)	5th Semester (Winter)	6th Semester (Summer)
Basic Mathematics 8	Differential and Integral Calculus 8	Modeling and Simulation with Ordinary Differential Equations 5	System Elective 5	Modeling Elective 5	Free Elective 5
Engineering Mechanics I - Statics 6	Engineering Mechanics II - Structural Mechanics Modeling 5	Engineering Mechanics III - Dynamics 5	Test, Analysis, and Simulation 5	Optional Engineering Elective 5	Optional Engineering Elective 5
Electrical Engineering (1) >	Electrical Engineering (2) 7	Thermodynamics II 5	Heat Transfer 5	Aerospace Lab Course I 5	Aerospace Lab Course II 4
Aerospace Materials Science and Processing (1) >	Aerospace Materials Science and Processing (2) 7	Aerospace Structures and Elements (1) >	Aerospace Structures and Elements (2) 9	Supplementary Course I 3	Supplementary Course II 3
Computational Foundations I 5	Computational Foundations II 5	Fluid Mechanics I 6	Fluid Mechanics II 5	Engineering Internship 8	Bachelor's Thesis 12
CAD/TD for Aerospace Engineers 3	Thermodynamics I 5	Introduction to Geodesy and Geoinformation 3	Automatic Control Engineering 5	Engineering Project 5	
Introduction to Aerospace 3					

Sum of Credits (semester)	25	Sum of Credits (semester)	37	Sum of Credits (semester)	24	Sum of Credits (semester)	34	Sum of Credits (semester)	31	Sum of Credits (semester)	29	<b>Total</b>	<b>180</b>
Examinations	6	Examinations	6	Examinations	6	Examinations	6	Examinations	6	Examinations	6		<b>36</b>

### **Appendix 3: Guidelines for the Industrial Internship**

**Guidelines for Practical Education and Training of Students  
in the Bachelor's and Master's Degree Programs in  
Aerospace at the Technical University of Munich**  
Department of Aerospace and Geodesy (*LRG*)  
Technical University of Munich

**Valid for all students beginning their academic studies in the Department of  
Aerospace and Geodesy at the Technical University of Munich starting in WS  
2021/2022.**

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## 1. Educational Goal of Practical Work

<sup>1</sup>Engineers for aerospace technology work in different fields of research and development as well as in service and operations; they have planning and managerial duties, oversee complex equipment, coordinate their operations and maintenance, and perform business-related and sales-related tasks.

<sup>2</sup>To meet all these needs, a synthesis is typically formed between different disciplines and aspects.

<sup>3</sup>This should also be reflected in the industrial internship in which students gain complementary knowledge for their engineering degree and experience from the professional world as well as from workshops. <sup>4</sup>In the process, the goal is not only to become familiar with certain technologies and processes but also to gain practical insight into different activities and fields of work.

<sup>5</sup>Another essential aspect is accounting for the sociological side of the experience. <sup>6</sup>Interns must also see a business as a social structure and become familiar with the relationship between managers and staff so that they can get a good sense of their own future positions and potential impact during their likely future roles as supervisors.

<sup>7</sup>Overall, an internship is an important building block for acting responsibly in the future, and it is an integral part of practical education and training.

## 2. Industrial Internship

The entire industrial internship consists of an internship completed before students begin their studies and a specialized internship, which is undertaken during their studies.

### 2.1 Pre-Study Internship

<sup>1</sup>The pre-study internship serves to convey fundamental manufacturing know-how, which can also be obtained during internships in smaller businesses. <sup>2</sup>Experience in production-related areas is a prerequisite for having insight into what is viable and feasible in practice. <sup>3</sup>Furthermore, the knowledge gained from the first work placement will help students better understand lectures and exercises in construction-related subjects for the bachelor's degree.

<sup>4</sup>The pre-study internship is usually completed in industrial production where essential elementary knowledge is conveyed. <sup>5</sup>Interns should learn about practical applications while under the guidance of a supervisor from the field and should get an overview of the production facilities and processes. <sup>6</sup>Additionally, interns should gain insight into quality assurance and testing. <sup>7</sup>The pre-study internship can also be completed in one of the two other relevant areas of aerospace industry, namely development or the service and operations department.

### 2.2 Specialized Internship

<sup>1</sup>The specialized internship is intended to give students general insight into their future career, technical, business or organizational contexts, and the meaning of technology and engineering in our society. <sup>2</sup>This part of the internship allows students a great deal of freedom of choice depending on their inclinations and the opportunities available. <sup>3</sup>Overall, after the 14 weeks of pre-study and specialized internship, students must be able to verify having completed an internship for at least 4 consecutive weeks in each of two of the three possible fields:

- A) production,
- B) development, or
- C) service/operations.

<sup>4</sup>As part of the Bachelor's degree in Aerospace, the specialized internship can be completed for a period of at least six weeks during the 5th semester of enrollment in the current degree program, and it will be awarded 8 credits. <sup>5</sup>Alternatively, there is the possibility of completing a project

seminar at the Chair, which lasts six weeks and is awarded 8 credits. <sup>6</sup>In this case, the project seminar counts as its own area.

### 3. Duration and scheduling of the industrial internship

#### 3.1 Duration

<sup>1</sup>The industrial internship covers a compulsory pre-study internship for a period of at least eight weeks. <sup>2</sup>As part of the Bachelor's degree in Aerospace, it is followed by a specialized internship, which is at least six weeks in length. <sup>3</sup>To be admitted to the Master's degree program in Aerospace, students are required to verify an industrial internship of at least eight weeks.

<sup>4</sup>The internship period in a company must entail, at a minimum, one consecutive week. <sup>5</sup>To cover one of the areas named in No. 2.2, four consecutive weeks are required. <sup>6</sup>The weekly working hours are based on the standard hours of work valid in Germany.

#### 3.2 Areas of Work

<sup>1</sup>The requirements for the industrial internship (pre-study internship and specialized internship, at least 14 weeks in total) are met if the internships were completed in two of these three potential areas of work:

- A) production,
- B) development
- C) service/operations

<sup>2</sup>A field is considered covered if an internship has been completed which lasted at least four consecutive weeks.

#### 3.3 Scheduling

<sup>1</sup>The eight-week pre-study internship must be completed prior to the start of the degree program. <sup>2</sup>Verification that the pre-study internship has been completed is a prerequisite for admission to the bachelor's program. <sup>3</sup>If admission is granted on the condition that an industrial internship must be undertaken, it must be completed and verified within the first academic year. <sup>4</sup>To be approved in time, the documents must be submitted, at the latest, four weeks prior to the end of the second semester of enrollment in the degree program.

## 4. Undertaking the Industrial Internship

#### 4.1 Internship plan

<sup>1</sup>The pre-study and specialized internship are not different from one another in terms of content-related requirements. <sup>2</sup>They can be completed in production as well as in development or in the service or operations departments.

<sup>3</sup>However, the typical tasks students undertake in a *pre-study internship* are:

- Manufacturing engineering such as forming or deforming production processes, joining and cutting processes, installation, integration and assembly
- Tasks in the area of testing and quality control
- Work in trials, development, construction, calculations and tests for technical project plans, machinery, parts, materials, processes and methods
- Production development and production planning
- Servicing and maintenance work

<sup>4</sup>In the *specialized internship*, it is especially recommended to work in areas that supplement and enhance university studies, such as collaborating in

- Activities related to project management, i.e. planning, coordination as well as technical and business monitoring of project workflows
- Technical monitoring and complex equipment and systems during operation
- Sales-related work as well as marketing of technical products
- Preparing complex technical offers
- Tasks related to technical business planning
- Studies on demand, requirements and impact of existing and planned technical systems and products in terms of environment and society

<sup>5</sup>The work mentioned can be found in medium-sized and large companies as well as, to some extent, in public authorities and organizations. <sup>6</sup>In addition to being exposed to a variety of tasks, interns should also strive to work in different departments in order to learn about different department and company cultures. <sup>7</sup>However, most of the activities listed require a certain amount of training time so that an internship of several consecutive weeks is often required for the work to be meaningful.

<sup>8</sup>It usually makes the most sense to do the specialized internship after the 4th semester of enrollment. <sup>9</sup>Irrespective of the individually selected areas of work, students are expected to gain an overview of the products and services of the respective business as well as the technical and organizational integration of the departments that they worked in during their internship. <sup>10</sup>This must be included in the internship report.

<sup>11</sup>The specialized internship can be substituted in part or entirely by a pre-study internship if it fulfills these guidelines in terms of its duration and breakdown.

## 4.2 Reporting and Verification of Internship

<sup>1</sup>Successfully completing the internship or parts thereof is verified by:

1. A report signed by the student detailing which area (A, B or C) the internship relates to. For the pre-study internship, this report should be three to four pages (continuous text, work steps, sketches, special aspects, ...); for the specialized internship, it should also summarize the work performed in addition to the providing information on the product and organization mentioned in point 4.1 (approximately 5 pages recommended); the summary of the work performed does not have to be done if the student can prepare a technical report on his/her work for the internship company for the internship period concerned  
and
2. the company provides relevant written certifications thereof; furthermore, at a minimum, the period of work, the type of work performed and the social demeanor of the intern in the company must be indicated in a separate company certificate.

<sup>2</sup>Internship work is verified by submitting the original company certificates and the report to the Internship Office.

## 5. Interns in a Company

### 5.1 Practical Training Companies

<sup>1</sup>The knowledge to be conveyed in the internship regarding the manufacturing process, the observation of economically feasible working methods, and the development of an awareness of social aspects of work processes should be acquired in industrial companies, which are also recognized by the Chamber of Commerce and Industry as companies offering practical training. <sup>2</sup>The internship can be undertaken in companies in the aerospace industry, the machine construction or automobile, electrical or chemical industries, in the mining sector, with the Federal Railway or in large craftsmen firms if all of the prerequisites for practical training specified in these guidelines are met. <sup>3</sup>Work in institutions of higher education or research institutions can be accepted if it complies with the guidelines.

## 5.2 Supervision of Interns

<sup>1</sup>Supervision of interns in companies is usually undertaken by a contact person who ensures meaningful support is provided to interns that corresponds to the training opportunities in their company. <sup>2</sup>The contact person also instructs interns on technical issues during meetings and discussions.

<sup>3</sup>Interns from institutions of higher education are not required to attend a vocational college. <sup>4</sup>Voluntary participation in lessons taught at training schools may not influence the already short period of time for the intern to work in the specialized departments.

## 6. Legal and Social Position of Interns

### 6.1 Applying for an Internship Position

<sup>1</sup>Prior to beginning practical training, the future intern should become familiar with the details of the rules by reading these guidelines thoroughly or by inquiring with the Internship Office for the TUM Department of Aerospace and Geodesy (*LRG*) in special cases; these guidelines provide important information on doing the internship and reporting on the work performed during the internship, etc.

<sup>2</sup>Since internship positions are not arranged by the university, interns must contact companies themselves and request an internship position. <sup>3</sup>The Internship Office and the LRG Departmental Student Council at the Technical University of Munich can provide assistance.

### 6.2 Internship Contract

<sup>1</sup>A legally binding employment contract for the internship is entered into between the company and intern. <sup>2</sup>The contract must specify all rights and duties of interns and the company providing the training as well the type and duration of the internship.

### 6.3 Financial Aid for Practical Education & Training

<sup>1</sup>The specialized internship as well as the pre-study internship are considered practical education and training in the sense of tertiary education and are thus eligible for student financial aid under the German Federal Training Assistance Act (*BAföG*). <sup>2</sup>Interns should contact the local authorities in their community that are responsible for granting financial aid.

### 6.4 Insurance Obligations

Issues regarding insurance obligations are regulated by corresponding laws.

### 6.5 Holidays, Illness, Absences from Work

<sup>1</sup>Absences of more than three days during the industrial internship must be made up. <sup>2</sup>This includes any time missed from work due to illness, holidays or any other hindrance. <sup>3</sup>Company holidays are also considered an absence from work. <sup>4</sup>The only exception to this rule is any legally established bank holiday. <sup>5</sup>In the event interns are absent from work, they should request the contract be extended so that they can finish the training phase they began to the extent required.

<sup>6</sup>If an intern has a medical certificate that indicates s/he is not able to fully complete the training prescribed during a production internship due to a prolonged or ongoing physical disability or chronic illness, the time missed from work can be made up by working in the construction office, undertaking work planning tasks, testing materials or working in a laboratory after consulting with the Internship Office.

## 7. Approval of Internship

<sup>1</sup>The internship is approved by the Internship Office in the Department of Aerospace and Geodesy. <sup>2</sup>For an internship to be approved, properly prepared activity reports and the original internship certificate must be submitted.

<sup>3</sup>The type and duration of individual work phases must be clearly presented in the documents.

<sup>4</sup>The Internship Office will decide to what extent the practical work meets these guidelines and whether the internship can be approved. <sup>5</sup>Practical education and training which is not documented sufficiently in a report because it is incomplete or not written intelligibly will only be partially approved for part of the period. <sup>6</sup>The Internship Office can also prescribe additional training weeks if the internship certificate and report do not indicate that individual internship phases were carried out to a sufficient degree.

## 8. Special Provisions

### 8.1 Professional Training

<sup>1</sup>Relevant occupational activities that correspond to the requirements set out in these internship guidelines are credited for the maximum 14-week period of the internship. <sup>2</sup>An apprenticeship will be approved if it corresponds to the internship guidelines.

### 8.2 Internship Outside of the Industry

#### *General Rules*

<sup>1</sup>Internships that are in non-industrial areas require the prior approval of the Internship Office. <sup>2</sup>Moreover, students may not work in non-industrial areas for more than six weeks in total.

#### *Internships by military service personnel in the German Armed Forces*

<sup>3</sup>Applicants to universities are required to apply for assignment to a suitable technical unit prior to the start of their military service. <sup>4</sup>After consulting with the Internship Office, the internship periods completed can be credited with a maximum of six weeks if the work was performed in accordance with No. 3.1 of these guidelines. <sup>5</sup>The corresponding reports and certificates (ATN and military service certificate) must be submitted to the Internship Office for approval purposes. <sup>6</sup>By decree, the Federal Minister of Defense authorized the drafting of internship reports and the issuance of an internship certificate (see Ministerialblatt des Bundesministers der Verteidigung 1963, p. 291, as amended on 12.07.1967, VMBI 1967, p. 213).

<sup>7</sup>This rule for awarding credit is applied to soldiers completing basic military service, soldiers serving longer periods of service (professional soldiers), and people completing community service and alternative forms of public service.

### 8.3 Other Industrial Employment Arrangements

<sup>1</sup>If it fulfills the requirements of these internship guidelines, a job as a student trainee or another type of gainful activity can be approved as an internship. <sup>2</sup>However, it is not permitted to directly substitute research work/papers to be completed within the scope of studies with a specialized internship, or vice versa. <sup>3</sup>This is the case because, while an internship is intended to give students insight into a broad spectrum of techniques and procedures, research work requires students to undertake more independent and in-depth work on more specific technical and engineering-related tasks.

<sup>4</sup>In the event of uncertainty about the compatibility of an internship being pursued with these guidelines, please consult with the Internship Office in advance.

### 8.4 Internships Abroad

<sup>1</sup>It can be advantageous for students' career to do part of their internship abroad. <sup>2</sup>It is a good way for students pursuing an engineering career to increase their technical qualifications as well as gain insight into the cultural, social and economic structures in other countries. <sup>3</sup>For this reason, students can complete their industrial internship in suitable companies in foreign countries if the knowledge to be gained corresponds to the internship plan prescribed. <sup>4</sup>The reports must be written in either German or English, or written in two languages (German plus a national language). <sup>5</sup>The internship certificate must be written in the respective official language; a certified translation of the certificate into German must be submitted with the original. <sup>6</sup>Exceptions are made for certificates written in English. <sup>7</sup>No translation is required in this case.

<sup>8</sup>A period of up to 14 weeks will be recognized.

## 9. Inquiries

Inquiries about these guidelines and individual applications should be sent to the Internship Office of the TUM Department of Aerospace and Geodesy.

Address: Technical University of Munich

Praktikumsamt der Fakultät für Luftfahrt,  
Raumfahrt und Geodäsie

Willy-Messerschmitt-Str. 1

82024 Taufkirchen/Ottobrunn, Germany

Telephone: +49 (0)89/289-55507

Email: [praktikum@lrg.tum.de](mailto:praktikum@lrg.tum.de)

### Remarks

These guidelines initially apply to students who are enrolled in the Aerospace Department at the Technical University Munich starting in the Winter Semester 2021/2022.

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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 on 26 April 2021.

Munich, 26 April 2021

Technical University of Munich

Thomas F. Hofmann  
President

These Regulations were made available for inspection at the Technical University of Munich on 26 April 2021, following their announcement on 26 April 2021. Day of proclamation shall therefore be 26 April 2021.