

## **UNOFFICIAL TRANSLATION**

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This is a translation of the Examination Regulations of the master's program *Microsystems Engineering* that were passed (in German) by the University of Freiburg Senate in its meeting on August 19, 2005 (Official Bulletins, Volume 36, No. 46, pp. 269-293) and adapted on September 30, 2021 (Official Bulletins, Volume 52, No. 65, pp. 314-344) – with amendments

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### **Examination regulations for the Master of Science (M.Sc.) program**

#### **Appendix B. Subject-specific regulations for the Master of Science (M.Sc.)**

##### **examination regulations**

##### **Microsystems Engineering**

#### **§ 1 Program profile**

(1) The master's program Microsystems Engineering is research-oriented and consecutive.

(2) The internationally oriented, English-taught master's program in Microsystems Engineering is aimed particularly at graduates of bachelor's programs in engineering and natural sciences that are not specifically oriented towards microsystems technology. In addition to a basic understanding of microsystems technology methods, the master's program imparts microsystems-specific knowledge in the areas of circuits and systems as well as materials and manufacturing processes. A major focus is also on the applications of microsystems technology such as biomedical technology or optics and photonics. Depending on the individual focus, students can acquire and deepen special knowledge in one or more of these areas or choose one of the areas of Circuits and Systems, Materials and Fabrication, Biomedical Engineering and Photonics as a specialization, which is shown in the degree certificate. Students are qualified to research, develop and apply microsystems technology solutions in their future engineering career. The successful completion of the master's program qualifies students for an academic career in the field of research and development as well as for an engineering-scientific activity in industry, in research organizations or with state authorities.

#### **§ 2 Program entry and scope**

(1) The master's program in Microsystems Engineering can only be entered in the winter semester.

(2) The master's program in Microsystems Engineering consists of coursework equivalent to 120 ECTS credits.

#### **§ 3 Language of instruction and examinations**

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(1) Courses and examinations in the master's programme Microsystems Engineering are generally held in English. Individual modules and courses, which are freely selectable, and their associated examinations can also be held entirely or partly in German.

(2) With the prior consent of the person responsible for the module, the examinations can also be carried out in the other language.

(3) The modules offered in German require proof of German language skills corresponding to at least level B2 of the Common European Framework of Reference for Languages.

### § 4 Content of the program

(1) The master's program Microsystems Engineering is divided into the compulsory area and the two compulsory elective areas Advanced Microsystems and Microsystems Engineering Concentration Areas. The modules that can be taken in the individual areas and the corresponding courses are listed and described in more detail in the respective module handbook. According to the specifications mentioned in Paragraph 6, the Master's degree programme Microsystems Engineering can be studied with a specialization.

(2) In the compulsory area with a performance scope of 60 ECTS credits, all modules listed in the following table must be completed. The prerequisites and contents of the master's modules are regulated in more detail in §§ 8 and 9.

**Table 1: Compulsory area (60 ECTS-Credits)**

<b>Module</b>	<b>Format</b>	<b>Contact hours (per week)</b>	<b>ECTS-credits</b>	<b>Semester</b>	<b>Assessment: Studienleistung/ Prüfungsleistung</b>
Micro-electronics	V + Ü	4	6	1	PL: written exam
Micro-mechanics	V + Ü	4	6	1	PL: written exam
MST Design Laboratory I for Microsystems Engineering	V + Ü	4	6	1	SL
MST Technologies and Processes	V + Ü	4	6	1	SL PL: written exam
Signal Processing	V + Ü	4	6	2	PL: written exam
Master's Module			30	4	PL: master's thesis PL: oral presentation

Abbreviations in the tables:

Type = type of course; Semester = recommended semester; MST = Microsystems Technology; Pr = practical course; Ü = exercise; V = lecture; SL = Studienleistung/pass/fail assessment; PL = Prüfungsleistung/graded assessment.

(3) A total of 60 ECTS credits must be earned in the compulsory elective area. Of these, 30 ECTS points are allotted to the area of Advanced Microsystems. At the student's choice, five of the modules listed in Table 2 must be completed.

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**Table 2: Advanced Microsystems (30 ECTS-Credits)**

Module	Format	Contact hours per week	ECTS-credits	Semester	Assessment: Studienleistung/ Prüfungsleistung
Assembly and Packaging Technology	V + Ü	4	6	1, 2 oder 3	PL: written exam
Micro-optics	V + Ü	4	6	1 oder 3	SL PL: written exam
Modelling and System Identification	V + Ü	4	6	1 oder 3	SL PL: written exam
Probability and statistics	V + Ü	4	6	1 oder 3	SL PL: written exam
Sensors	V + Pr	4	6	1 oder 3	SL PL: written exam
Biomedical Microsystems	V + Ü	4	6	2	SL PL: written exam
Micro-actuators	V + Ü	4	6	2	SL PL: written exam
Micro-fluidics	V + Ü	4	6	2	PL: written exam

(4) The remaining 30 ECTS credits of the compulsory elective area are allocated to the Microsystems Engineering Concentration Areas. The student chooses one of the four concentration areas Circuits and Systems, Materials and Fabrication, Biomedical Engineering and Photonics and completes, at his/her own choice, as many modules from the range of courses provided for this in the module handbook as are required to achieve a total of 30 ECTS points; in the case of paragraph 5, sentence 1, the ECTS points allotted to the area of Customized Course Selection are to be deducted from the 30 ECTS points, up to a maximum of 9 ECTS points. Each module has a scope of 3, 6 or 9 ECTS points and must be concluded with a graded assessment (Prüfungsleistung); depending on the structure of the associated courses, the modules offered may also require additional pass/fail assessments (Studienleistungen). It is guaranteed that the students can choose between different types of graded assessments (Prüfungsleistungen).

(5) Up to nine of the ECTS points provided for the area of Microsystems Engineering Concentration Areas in accordance with Paragraph 4, Sentence 1 can also be acquired in the area of Customized Course Selection by completing suitable modules or courses from courses offered by other degree programs of the Albert Ludwig University, language courses from the range of courses offered by the seminars and institutes of the Faculty of Philology and the Faculty of Philosophy (courses for students of all faculties) or modules from courses offered in this degree program. The board of examiners decides on the suitability of the modules or courses from the range of courses offered by other degree programs of the Albert Ludwigs University in consultation with the respective subject. In the modules or courses from the range of courses offered by other degree programs as well as in language courses, only pass/fail assessment (Studienleistungen) are required. For the modules from the range of courses offered by this degree program, paragraph 4, sentences 3 and 4 shall apply accordingly.

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(6) If one of the four areas Circuits and Systems, Materials and Fabrication, Biomedical Engineering and Photonics is chosen as a specialization, modules with a total of at least 30 ECTS credits must be completed from the range of courses offered by the Institute of Microsystems Engineering in the module handbook for the specialization in question. In addition, the topic of the Master's thesis must be chosen from the area of the selected specialization.

### **§ 5 Pass/fail assessments (Studienleistungen)**

Non-graded assessments can consist, for example, of written examinations, presentations or posters, the completion of exercise sheets and project tasks or the performance of experiments.

### **§ 6 Graded assessments (Studienbegleitende Prüfungsleistungen)**

Written graded assessments are examinations (written supervised work) and written elaborations. Oral graded assessments are oral examinations (examination discussions) and oral presentations. Practical graded assessments consist of the performance of experiments and the creation and demonstration of software or demonstrators.

### **§ 7 Repeat of graded assessments**

(1) Assessments graded "not adequate" (5.0) or considered as failed, can be repeated once. In addition, a maximum of two failed graded assessments, which consist of a written or oral examination, can be repeated a second time.

(2) If a student fails a graded assessment in a module in one of the areas of Advanced Microsystems or in the selected specialization in the area of Microsystems Engineering Concentration Areas, he/she may, instead of retaking this graded assessment, also take another suitable module once and take the graded assessment during that course. The failed examination attempt in the originally selected module must not be considered as one of the failed attempts in the newly selected module.

(3) A maximum of one passed examination in the form of a written examination or an oral examination may be repeated once for the purpose of improving the grade. The repeat examination is to be taken in the next regular examination date and in the third semester at the latest. The graded assessment with the better grade will be taken into account.

### **§ 8 Admission to the Master's thesis**

Only those who are enrolled in the Master's program in Microsystems Engineering and have successfully completed modules with a total of at least 72 ECTS credits can be admitted to the master's thesis.

### **§ 9 Master's thesis**

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- (1) The Master's thesis must be completed within a period of six months and is worth 27 ECTS credits. If a specialization is chosen, the topic of the master's thesis shall be selected from the specialization in question.
- (2) The master's thesis must be written in English or in German.
- (3) The master's thesis shall be submitted to the Board of Examiners (Fachprüfungsausschuss) in bound form in single copy and additionally in electronic form on the specified data carrier system in the specified file format. In the case of data or software-related work, the submission of the program codes and data used may also be required.
- (4) At least one of the two examiners of the master's thesis must be employed full-time at the Institute of Microsystems Engineering at the Faculty of Engineering of the Albert Ludwig University Freiburg.
- (5) The master's thesis is supplemented by an approximate 60-minute master's colloquium (thesis defence), which is held in English or German depending on the student's choice. The master's colloquium is usually led and evaluated by the supervisor of the master's thesis and consists of a 20-minute presentation by the student on the results of the master's thesis and a subsequent discussion. Admission to the master's colloquium will only be granted if the master's thesis has been submitted. The master's colloquium is worth 3 ECTS credits and is usually open to members of the university.

### **§ 10 Calculation of the final overall grade**

- (1) The final overall grade of the master's examination is calculated according to the arithmetic mean of module grades with regard to the allocation of ECTS credits.
- (2) If all the module grades are "very good" - 1.3 or better - or if the overall grade of the master's examination is 1.0, the grade "with distinction" will be awarded.

### **§ 11 Subject designation with specialization supplement in the degree documents**

In the case of successful completion of the master's program Microsystems Engineering with one of the four specializations Circuits and Systems, Materials and Fabrication, Biomedical Engineering or Photonics, the title of the subject Microsystems Engineering shall be added to the degree certificate according to the completed specialization with the addition "Specialization Circuits and Systems", "Specialization Materials and Fabrication", "Specialization Biomedical Engineering" or "Specialization Photonics".

### **Transitional regulation § 31 of the General Examination Regulations**

(#) Students already enrolled in the Master of Science Microsystems Engineering degree programme at the Albert Ludwigs University before 1 October 2021 may complete their studies according to the corresponding subject-specific regulations of these examination regulations of 19 August 2005 (official announcement). August 2005 (Official Announcements Jg. 36, No. 46, pp. 269-293) in the version of the Thirty-Ninth Amendment Statute of 17 December 2018 (Official Announcements Jg. 49, No. 69, pp. 489-516) until 30 September 2023 at the latest (cut-off date). In this case, the student must declare in writing to the Examination Office by 31

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October 2021 at the latest that he/she wishes to continue his/her studies in accordance with the subject-specific regulations for Microsystems Engineering of these Examination Regulations in the version of the Thirty-Ninth Amendment Statutes of 17 December 2018. This declaration is irrevocable.