

**First Amendment to the Course-Specific
Examination Regulations
for the Master's Course of Study in
Simulation Sciences
of RWTH Aachen University**

Dated August 27, 2018

Please note: This publication is an English translation. Only the German original of these regulations as published in the Official Announcements of RWTH Aachen University ("Amtliche Bekanntmachungen") is legally binding.

Based on §§ 2 (4) (64) of the law governing the Universities of the Federal State of North Rhine-Westphalia (Higher Education Act – HG) in the version dated September 16, 2014 (Law and Official Gazette of the State of North Rhine-Westphalia p. 547), most recently amended by Article 3 of the Act to Ensure the Accreditation of Courses of Study in North Rhine-Westphalia from October 17, 2017 (Law and Official Gazette of the state of North Rhine-Westphalia p. 806), RWTH Aachen University (RWTH) has issued the following examination regulations:

Article I

The course-specific examination regulations for the Master's degree program Simulation Sciences of RWTH Aachen University dated January 11, 2017 (Official Announcements of RWTH, No. 2017/007) are amended as follows:

1. From the Winter Semester 2017/2018 the module catalog will be extended by the following modules:

- Angewandte Chemische Verfahrenstechnik / Applied Chemical Process Engineering [MSSiSc-5217]
- Module: Computational Systems Biotechnology 2 [MSSiSc-5614]

The module descriptions can be found in Appendix 1 of this amendment to the examination regulations.

2. From the Winter Semester 2017/2018, the following module is no longer offered:

- Numerische Integrationsverfahren für Strömungen in Turboarbeitsmaschinen und Strahlantrieben I (now: Numerische Integrationsverfahren für Strömungen in Turbomaschinen und Jet Propulsions I (NIST I) / Numerical Integration Algorithms for Flows in Turbomachines and Jet Propulsions I [MSSiSc-5413])

For students who are in a pending examination process, there will be three examination dates after the course is offered for the last time. Upon application to the Examination Board students may choose to complete the new modules.

From the Winter Semester 2017/2018, the module catalog will be expanded by the following module:

- Numerische Integrationsverfahren für Strömungen in Turbomaschinen und Jet Propulsions I (NIST I) / Numerical Integration Algorithms for Flows in Turbomachines and Jet Propulsions I [MSSiSc-5413]

The module descriptions can be found in Appendix 1 of this amendment to the examination regulations.

In the event that the previous modules are not completed by one of the remaining examinations, passed assessments and failed attempts are to be transferred to the new modules.

3. Starting in the 2018 summer semester, the module catalog will be expanded to include the following modules:

- Medical Imaging [MSSiSc-2015]
- Anatomy and Physiology [MSSiSc-1030]
- Additive Fertigungsverfahren / Additive Manufacturing [MSSiSc-1015]
- Advanced Techniques in Physics-Based Animation [MSSiSc-7133]
- Physics-Based Animation [MSSiSc-7132]

The module descriptions can be found in Appendix 1 of this amendment to the examination regulations.

4. From Summer Semester 2018, the module description will of the following module will be replaced by the corresponding versions in Appendix 2 of these amendment to the regulations:

- Cell Culture and Tissue Engineering [MSSiSc-2014]

For students who have started with the changed module prior to the 2018 summer semester, three exams will be offered under the previous conditions. Upon application to the Examination Board, students may complete the new module.

Article II

This amendment to the regulations will be published as an Official Announcement and come into force on the day after its publication. It will apply to all students enrolled in the Bachelor's degree program.

Issued based on the resolutions of the Faculty Council of the Faculty of Mechanical Engineering dated September 12, 2017, October 17, 2017, and January 16, 2018.

The Rector
of RWTH
Aachen University

Aachen, August 27, 2018

sgd. Rüdiger
Univ.-Prof. Dr. rer. nat. Dr. h. c. mult. Rüdiger

Appendix 1: New Modules

Module: Angewandte Chemische Verfahrenstechnik / Applied Chemical Process Engineering [MSSiSc-5217]

MODULE TITLE: Angewandte Chemische Verfahrenstechnik / Applied Chemical Process Engineering					
Course Semester	2	Credit Points	5	Language	German
Title	Assignment to a Curriculum		Core Semester	CP	SWS
Applied Chemical Engineering Exam [MSSiSc-5217.a]	Variable-semester mandatory elective		2	5	0
Practical Course Applied Chemical Engineering [MSSiSc-5217.b]	Variable-semester mandatory elective		2	0	3
Prerequisites			Grading / Duration		
Necessary prerequisites: none Recommended prerequisites: Chemical Engineering (M.Sc.)			The module is graded based on a presentation and a written version of the assignment. 50% of the final grade is based on the presentation, the other 50% is based on the written version.		

Module: Computational Systems Biotechnology 2 [MSSiSc-5614]

MODULE TITLE: Computational Systems Biotechnology 2					
Course Semester	2	Credit Points	5	Language	German, English
Title	Assignment to a Curriculum		Course Semester	CP	SWS
Exam Computational Systems Biotechnology 2 [MSSiSc-5614.a]	Variable-semester mandatory elective		2	5	0
Lecture Computational Systems Biotechnology 2 [MSSiSc-5614.b]	Variable-semester mandatory elective		2	0	3
Tutorial Computational Systems Biotechnology 2 [MSSiSc-5614.c]	Variable-semester mandatory elective		2	0	2
Prerequisites			Grading / Duration		
Recommended: <ul style="list-style-type: none"> - Basic mathematical lectures (linear algebra, analysis) - Basic knowledge of biochemistry (enzymes) - Basic knowledge of MATLAB - Missing prerequisites on biochemical reaction networks and cell biology will be made up as part of the course via short bridge courses or self-study material. Among them: - Basics of cell biology of unicellular organisms (bacteria, yeasts) - Basic metabolic networks (glycolysis, citrate cycle) - Basic mechanisms of gene regulation 			The final grade is based 20% on the completion of assignments between the introductory lectures and the week of block seminars, and 80% on a final one-on-one oral examination		

Module: Additive Fertigungsverfahren / Additive Manufacturing [MSSiSc-1015]

MODULE TITLE: Additive Manufacturing / Additive Manufacturing					
Course Semester	1	Credit Points	6	Language	German
Title	Assignment to a Curriculum		Course Semester	CP	SWS
Written Exam Additive Manufacturing [MSSiSc-1015.a]	Variable-semester mandatory elective		1	6	0
Lecture Additive Manufacturing [MSSiSc-1015.b]	Variable-semester mandatory elective		1	0	2
Additive Manufacturing Tutorial [MSSiSc-1015.c]	Variable-semester mandatory elective		1	0	2
Prerequisites			Grading / Duration		
Recommended prerequisites: - Knowledge of manufacturing technology - Knowledge of heat and mass transfer - Knowledge of laser technology			Written exam		

Module: Numerische Integrationsverfahren für Strömungen in Turbomaschinen und Jet Propulsions I (NIST I) / Numerical Integration Algorithms for Flows in Turbomachines and Jet Propulsions I [MSSiSc-5413]

MODULE TITLE: Numerische Integrationsverfahren für Strömungen in Turbomaschinen und Jet Propulsions I (NIST I) / Numerical Integration Algorithms for Flows in Turbomachines and Jet Propulsions I					
Course Semester	2	Credit Points	6	Language	German
Title	Assignment to a Curriculum		Course Semester	CP	SWS
Exam Numerical Integration Methods for Flows in Turbomachinery and Jet Propulsion I (NIST I) [MSSiSc-5413.a]	Variable-semester mandatory elective		2	6	0
Lecture Numerical Integration Methods for Flows in Turbomachinery and Jet Propulsion I (NIST I) [MSSiSc-5413.b]	Variable-semester mandatory elective		2	0	2
Exercise Numerical Integration Methods for Flows in Turbomachinery and Jet Propulsion I (NIST I) [MSSiSc-5413.c]	Variable-semester mandatory elective		2	0	2
Prerequisites			Grading / Duration		
Recommended prerequisites: - Thermodynamics - Fluid Mechanics - Basics of Turbomachinery			Oral examination		

Module: Medical Imaging [MSSiSc-2015]

MODULE TITLE: Medical Imaging					
Course Semester	2	Credit Points	5	Language	English
Title	Assignment to a Curriculum		Course Semester	CP	SWS
Lecture "Medical Imaging" [MSSiSc-2015.a]	Fixed-semester mandatory course		2	0	2
Practical Course "Medical Imaging" [MSSiSc-2015.c]	Fixed-semester mandatory course		2	0	2
Exam "Medical Imaging" [MSSiSc-2015.d]	Fixed-semester mandatory course		2	5	0
Prerequisites			Grading / Duration		
<p>Recommended:</p> <p>You should have successfully passed the module Anatomy/Physiology in the 1st semester. Attendance at the lectures is voluntary, but attendance at the practical courses is compulsory. No more than 10% absence – including absence justified by a medical certificate – is acceptable for the compulsory parts. The exam can only be taken if the compulsory parts have been completed.</p>			<p>Written Exam Duration 90-120 min. A minimum score of usually 50% is required to pass. The grade of the module is the grade of the exam.</p>		

Module: Anatomy and Physiology [MSSiSc-1030]

MODULE TITLE: Anatomy and Physiology					
Course Semester	1	Credit Points	5	Language	English
Title	Assignment to a Curriculum		Course Semester	CP	SWS
Lecture: Anatomy- Physiology [MSSiSc-1030.a]	Fixed-semester mandatory course		1	0	2
Practical Course: Anatomy-Physiology [MSSiSc-1030.c]	Fixed-semester mandatory course		1	0	1
Exam: Anatomy-Physiology [MSSiSc-1030.d]	Fixed-semester mandatory course		1	5	0
Prerequisites			Grading / Duration		
<p>Knowledge in Physics and Chemistry</p> <p>Attendance at the lectures is voluntary but attendance at the practical course or exercise is compulsory. Only 10% absence – including absence justified by a medical certificate – is acceptable for the compulsory parts. The exam can only be attended if the compulsory parts have been completed.</p>			<p>Written Exam. Duration for both exams 90-120 minutes (i.e. Anatomy and Physiology). Usually, a minimum score of 50% in each partial exam is required to pass. The grade for the anatomy part exam consists of the written exam score (95%) and a 5-10 min. practical (microscopy) test (5%). The grade for the physiology part of the exam is based on the exam score. The overall grade of the module is the average of the grades awarded for each partial exams. Each partial exam has to be passed and will be equally considered. In case of a partial exam failure, only the failed part will have to be repeated.</p>		

Module: Additive Fertigungsverfahren / Additive Manufacturing [MSSiSc-1015]

MODULE TITLE: Additive Manufacturing / Additive Manufacturing					
Course Semester	1	Credit Points	6	Language	German
Title	Assignment to a Curriculum		Course Semester	CP	SWS
Exam Additive Manufacturing [MSSiSc-1015.a]	Variable-semester mandatory elective		1	6	0
Lecture Additive Manufacturing [MSSiSc-1015.b]	Variable-semester mandatory elective		1	0	2
Additive Manufacturing Tutorial [MSSiSc-1015.c]	Variable-semester mandatory elective		1	0	2
Prerequisites			Grading / Duration		
Recommended prerequisites: - Knowledge of manufacturing technology - Knowledge of heat and mass transfer - Knowledge of laser technology			Written exam		

Module: Advanced Techniques in Physically-Based Animation [MSSiSc-7133]

MODULE TITLE: Advanced techniques of physics-based animation					
Course Semester	1	Credit Points	6	Language	English
Title	Assignment to a Curriculum		Course Semester	CP	SWS
Exam Advanced Techniques in Physics-Based Animation [MSSiSc-7133.a]	Variable-semester mandatory elective		1	6	0
Lecture Advanced Techniques in Physics-Based Animation [MSSiSc-7133.b]	Variable-semester mandatory elective		1	0	2
Exercise Advanced Techniques in Physics-Based Animation [MSSiSc-7133.c]	Variable-semester mandatory elective		1	0	2
Prerequisites			Grading / Duration		
Recommended prerequisites - Basic knowledge of numerical mathematics - Basic knowledge of algorithms and data structures, computer graphics, and successful participation in the lecture Physically-Based Animation			The final grade is the grade of the written or oral exam.		

Module: Physically-Based Animation [MSSiSc-7132]

MODULE TITLE: Physical based animation					
Course Semester	1	Credit Points	6	Language	English
Title	Assignment to a Curriculum		Course Semester	CP	SWS
Physically-Based Animation Exam [MSSiSc-7132.a]	Variable-semester mandatory elective		1	6	0
Lecture Physically-Based Animation [MSSiSc-7132.b]	Variable-semester mandatory elective		1	0	2
Tutorial Physically-Based Animation [MSSiSc-7132.c]	Variable-semester mandatory elective		1	0	2
Prerequisites			Grading / Duration		
Recommended prerequisites: - Basic knowledge of numerics - Basic knowledge of algorithms and data structures, computer graphics			The final grade is the grade of the written or oral exam.		

Appendix 2: Changed Module Descriptions

Module: Cell Culture and Tissue Engineering [MSSiSc-2014]

MODULE TITLE: Cell Culture and Tissue Engineering					
Course Semester	3	Credit Points	5	Language	English
Title	Assignment to a Curriculum	Course Semester	CP	SWS	
Lecture "Cell Culture and Tissue Engineering" [MSSiSc-2014.a]	Fixed-semester compulsory course	3	0	2	
Practical Course "Cell Culture and Tissue Engineering" [MSSiSc-2014.c]	Fixed-semester compulsory course	3	0	2	
Exam "Cell Culture and Tissue Engineering" [MSSiSc-2014.d]	Semester-fixed compulsory module	3	5	0	
Prerequisites	Grading / Duration				
<p>Recommended:</p> <p>Successful completion of the modules Medical Biology and Chemistry/Biochemistry from the first semester including the following subjects:</p> <p>CHEMISTRY Types of chemical bonds that hold atoms together in molecules. Polar and nonpolar molecules, and the important role that polarity plays in interactions of biological molecules. Concepts of acids, bases, pH, and buffering. Types of biomaterials that are available and their common uses.</p> <p>BIOMOLECULAR PRINCIPLES Basic concepts of biochemical energetics, including the role of adenosine-5'-triphosphate (ATP) in the transformation of energy into biochemical work. Major classes of biological polymers: proteins, polysaccharides, and nucleic acids. Structure of polysaccharides as polymers of monosaccharides, including the simple sugars glucose, galactose, and fructose. Basic structure of nucleic acids as polymers of nucleotides and how that structure is different in deoxyribonucleic acid (DNA) and ribonucleic acid (RNA) polymers. Basic structure of proteins, which are polymers of amino acids, and how the diversity of amino acid structure influences protein three-dimensional structure and function. Basic features of biological membranes, which are lipid bilayers that are decorated with proteins and carbohydrates.</p> <p>CELLULAR PRINCIPLES Basic components of eukaryotic cells and the differences between eukaryotic and prokaryotic cells. Basic role of the cytoskeleton, ribosomes, endoplasmic reticulum (ER), Golgi apparatus, mitochondria, lysosomes, and genomic deoxyribonucleic acid (DNA) in cell function. Structure of extracellular matrix (ECM) and its role in tissue function. Role of membrane proteins in regulating transport through cell membranes and regulating cell adhesion. Cell cycle and cell division by mitosis and meiosis. Basic principles of stem cells and differentiation. Basic elements of cell culture and its importance in modern biomedical science and engineering.</p> <p>Attendance at the lectures is voluntary, but attendance during the student presentations of research papers and the practical courses is mandatory. Only 10% absence - including absence with medical certificate - is acceptable for the compulsory parts. The exam can only be attended if the compulsory parts have been fulfilled.</p>	<p>Written exam. Duration 90-120 minutes, usually, a minimum score of 50% is required to pass. The grade of the exam is also the grade for the module..</p>				