OFFICIAL TRANSLATION OF

Neufassung der Fachspezifischen Bestimmungen für den Bachelorstudiengang Nanowissenschaften (Amtliche Bekanntmachung Nr. 60 vom 2. Juli 2014)

THIS TRANSLATION IS FOR INFORMATION ONLY – ONLY THE GERMAN VERSION SHALL BE LEGALLY VALID AND ENFORCEABLE!

Revised Subject-Specific Provisions for the Bachelor Degree Program in Nanosciences

dated 7 May 2014

On 26 May 2014, in accordance with Section 108 subsection 1 of the Hamburg higher education act (Hamburgisches Hochschulgesetz, HmbHG), the Executive University Board of Universität Hamburg ratified the Subject-Specific Provisions for the bachelor degree program in nanosciences as a subject leading to the Bachelor of Science (BSc) adopted on 7 May 2014 by the Faculty Council of the Faculty of Mathematics, Informatics and Natural Sciences in accordance with Section 91 subsection 2 number 1 HmbHG dated 18 July 2001 (HmbGVBI. p. 171) as amended on 14 May 2014 (HmbGVBI. p 99).

Preamble

These Subject Specific Provisions supplement the provisions of the Faculty of Mathematics, Informatics and Natural Sciences (MIN) Examination Regulations for degree programs with the designation Bachelor of Science (BSc) dated 11 April 2012 and 4 July 2012, as amended, and provide a description of the modules for the subject of nanosciences.

I. Supplemental provisions

Section 1
Program and examination objectives, academic degree, and implementation of the degree program

Section 1 subsection 1:

1. In addition to the general program goals set out in Section 1 subsection 1 of the BSc examination regulations, students completing the nanosciences program possess a broad basic knowledge of physics and chemistry; possess knowledge of the main informatics applications and fundamental mathematical required for nanoscience; have the ability to work responsibly within their field in accordance with the rules of good scientific practice; have the ability to act responsibly, particularly with regard to the impact of technological change and social implications; and are qualified for a subsequent master's degree.
2. Nanosciences cannot be studied as a minor.

Section 3
Subject advising

In addition to the general subject advice provided, students should receive regular advice from their mentor, at least once a semester.

Section 4
Program and examination organization, modules, and ECTS credits

Section 4 subsections 2 and 3:

1. The Bachelor of Science in Nanosciences is a modular program and comprises modules from the Departments of Physics, Chemistry, and Informatics.
2. The modules can be assigned to the following three categories with respect to content:
    a. fundamental chemistry (at least 62 ECTS credits);
    b. fundamental physics and mathematics (experimental and theoretical physics) (at least 61 ECTS credits);
    c. fundamental applied informatics (5 ECTS credits);
    d. general professional skills (orientation module, general professional skills [*Allgemeinen Berufsqualifizierenden Kompetenzen, ABK]*, *Herbstschule*) (7 ECTS credits);
    e. fundamental knowledge of subjects other than those listed in a–c as a free elective area (9 ECTS credits).
3. The required elective area expands on the fundamental of at least one of the areas listed in categories a and b in paragraph 2 (24 ECTS credits).

Students must successfully complete at least one theoretical module in physics or chemistry. The examinations board may approve an application for the inclusion of required elective modules other than those listed in Appendix A. The alternatives should have a logical connection to the degree program. Students may voluntarily complete additional modules in excess of 180 ECTS credits. Grades for additional modules do not count toward the final grade. Upon submission of a request to the examinations board, the additional examination grades may be reported in the transcript of records.

4. Module descriptions are provided in Annex A to the Subject-Specific Provisions for the Bachelor of Science in Nanosciences—Table of Modules.

A detailed description of the modules is provided in the module catalog for the bachelor degree program in nanosciences.

Section 5
Course types

Section 5 sentence 2:

In addition to the courses provided in accordance with Section 5 of the Revised Examination Regulations for the Bachelor of Science, the faculty also offers a *Herbstschule*. This is a block course that opens up current aspects of the subject to students and teachers. Usually, this involves a combination of multiple course types, such as lectures, poster presentations, and discussions.

Section 5 sentence 5:

As a rule, courses are taught in German. Exceptions are indicated in the respective module description and announced at the beginning of the course.

Section 5 sentence 6:

Attendance may be compulsory for individual courses. The module description indicates whether there is an attendance requirement.

Section 7
Examinations board

The board must contain at least one representative and one deputy each from the disciplines of both chemistry and physics. The academic staff member must be from the discipline of either chemistry or physics. The discipline of the representative and their deputies must alternate every two years.

The student member must be enrolled in the nanosciences degree program.

Section 13
Completed coursework and module examinations

Section 13 subsection 2:

Upon application by a student, the examinations board may, in justified exceptional cases, prescribe a different type of examination to be utilized for the absolute last possible reexamination attempt of a student.

Section 13 subsection 4:
The following rule applies to written examinations: the type and scope of noncompulsory coursework (usually the completion of exercises as homework) will be determined and announced at the beginning of the course.

At this point in time, it will also be determined and announced whether and to what extent successfully completed coursework will result in any bonus points.
Bonus points awarded may not exceed 40 percent of the minimum required to pass the written examination. Bonus points may only improve the grade for the module final examination by a maximum of 0.3.
The calculation and award of bonus points will be announced at the beginning of the respective course.

Section 13 subsection 5:
Examinations are held in either German or English. As a rule, an examination is held in the language in which the course was conducted.
If the examiner and the student agree, the examination may also be taken in a language that is different from the language of the module.

Section 14
Bachelor's thesis

Section 14 subsection 1:
A mandatory component of the bachelor's thesis is a presentation and a short academic discussion about the subject matter of the thesis.

Section 14 subsection 2 sentence 1:
Students who have earned at least a total of 120 ECTS credits may be allowed to commence work on their bachelor's thesis.
Students are recommended to complete all internships before commencing their bachelor's thesis.

Section 14 subsection 4:
The bachelor's thesis may be written in either German or English. This must be agreed between the student and the supervisor.

Section 14 subsection 5 sentence 2:
The workload for the final module amounts to 12 ECTS credits, and the bachelor's thesis must be completed within a period of no more than four months.

Section 15
Evaluation of examinations

Section 15 subsection 3 sentence 2:
The grade for the bachelor's final module is weighted five-sixths for the written thesis and one-sixth for the presentation and discussion. The supervisor assesses the presentation.

Section 15 subsection 3 sentence 5:
If a module is to be completed using component examinations, the components should be weighted as equally as possible.
The overall grade is calculated as an average of the grades earned for the components completed, weighted according to ECTS credits.

Section 15 subsection 3 sentence 9:
The overall grade is calculated as an average of all graded module examinations, weighted according to ECTS credits in consideration of the criteria in the table below.

Module or Field	Proportion of Total Grade
Physics for nanosciences A	The two best of the three examinations are each weighted at 12 ECTS credits.
Physics for nanosciences B	
Quantum chemistry / quantum physics	
Physical chemistry I	The best of the two examinations are weighted at 8 ECTS credits.
Physical chemistry II	
Nanochemistry I	The best of the two examinations are weighted at 8 ECTS credits.
Nanochemistry II	
Nanostructure physics A	The best of the two examinations are weighted at 16 ECTS credits.
Nanostructure physics B	
Required elective area	The arithmetic mean of the highest-graded advanced modules is weighted according to ECTS credits and totals 24 ECTS credits.
Final module: bachelor's thesis	This has a triple weighting of 12 ECTS credits.

Section 15 subsection 3 sentence 10:
The modules CHE 33 (Laboratory course in the basic principles of chemistry), CHE 35 (Exercises in nanochemistry), PHY-N-ABK, and PHY-N-S (*Herbstschule*, fall block course); the orientation module; and the elective area are not included in the calculation.

Section 23
Effective date

These Subject-Specific Provisions shall become effective on the day after they are ratified by the Executive University Board.

Hamburg, 26 May 2014
Universität Hamburg

Annex A Subject-specific conditions—Bachelor of Science in Nanosciences—Table of modules

Information about the Module					Courses				Examinations		
Duration in Semesters	Frequency	Recommended Semester	Module Type: required (Req.), required elective (RE), or elective (E)	Module Number/Code	Module	Course Title	Course Type	Credit hrs. p.w.	Type of Examination	Graded	ECTS credits
1	annually in the winter semester	first	Req.	PHY-N-OE	Orientation module				project completion	no	1
					OE		project	2			
Intended learning results: • Students have an overview of their studies and the examination and academic regulations. • Students understand the structures of the department, faculty, and University. • Students are able to manage problems arising at the start of the degree program. • Students are aware of the ethical and philosophical context surrounding nanosciences.											
1	annually in the winter semester	first	Req.	CHE 001 N	Introduction to general and inorganic chemistry				written final module examination	yes	8
						Experimental lecture principles of chemistry I	L	4			
						General chemistry with exercises	L + PC	2			
Intended learning results: Students understand the basic principles of general and inorganic chemistry.											
1	annually in the winter semester	first	Req.	CHE 002 N	Physical chemistry I				written final module examination	yes	4

<table>
<tr><td></td><td></td><td></td><td></td><td>Physical chemistry I
Exercises in physical chemistry I</td><td>L
PC</td><td>2
1</td><td></td><td></td><td></td></tr>
<tr><td colspan="10">Intended learning results:
Students have mastered the fundamental basic principles of physical chemistry and their safe application.</td></tr>
<tr><td>1</td><td>annually in the winter semester</td><td>first</td><td>Req. PHY-N1</td><td>Physics for nanoscience students A</td><td></td><td></td><td>written final module examination</td><td>yes</td><td>8</td></tr>
<tr><td></td><td></td><td></td><td></td><td>Physics for nanoscience students A
Exercises in physics for nanoscience students A</td><td>L
PC</td><td>4
2</td><td></td><td></td><td></td></tr>
<tr><td colspan="10">Intended learning results:
Students possess knowledge of basic and advanced concepts of classical physics with a focus on mechanics, particularly the characteristics of structures in the nanometer scale range.</td></tr>
<tr><td>1</td><td>annually in the winter semester</td><td>first</td><td>Req. PHY-N-M1</td><td>Mathematical foundations of physics A</td><td></td><td></td><td>written final module examination</td><td>yes</td><td>8</td></tr>
<tr><td></td><td></td><td></td><td></td><td>Mathematical foundations of physics A
Exercises in mathematical foundations of physics A</td><td>L
PC</td><td>4
2</td><td></td><td></td><td></td></tr>
<tr><td colspan="10">Intended learning results:
• Students are able to confidently differentiate and integrate the functions and basic principles of linear algebra.
• Students can recognize differential equations as descriptions of natural phenomena.</td></tr>
<tr><td>1</td><td>annually in the summer semester</td><td>second</td><td>Req. CHE 004 A</td><td>Physical chemistry II</td><td></td><td></td><td>written final module examination</td><td>yes</td><td>4</td></tr>
<tr><td></td><td></td><td></td><td></td><td>Physical chemistry II
Exercises in physical chemistry II</td><td>L
PC</td><td>2
1</td><td></td><td></td><td></td></tr>
<tr><td colspan="10">Intended learning results:
Students have mastered advanced principles of physical chemistry and their safe application.</td></tr>
<tr><td>1</td><td>annually in the summer semester</td><td>second</td><td>Req.</td><td>Organic chemistry</td><td></td><td></td><td>written final module examination</td><td>yes</td><td>6</td></tr>
</table>

CHE 081 A		
	Organic chemistry L 3 Exercises in organic chemistry PC 1	
Intended learning results: Students have mastered the basic principles of organic chemistry (substance groups and reaction mechanisms).		
1 annually in the summer semester second Req. CHE 011	Physical chemistry III	written final module examination yes 8
	Physical chemistry III L 4 Exercises in physical chemistry III PC 2	
Intended learning results: Students have mastered the fundamental basic principles of quantum mechanics, chemical bonds, and spectroscopy and their safe application.		
1 annually in the summer semester second Req. PHY-N-M2	Mathematical foundations of physics B	written final module examination yes 5
	Mathematical foundations of physics B L 2 Exercises in mathematical foundations of physics B PC 2	
Intended learning results: • Students are able to confidently differentiate and integrate the functions of multiple variables. • Students recognize differentiated and integral variables as natural laws in mathematical form.		
1 annually in the summer semester second Req. PHY-N2	Physics for nanoscience students B	written final module examination yes 8
	Physics for nanoscience students B L 4 Exercises in physics for nanoscience students B PC 2	
Intended learning results:		

Students possess knowledge of basic and advanced concepts of classical physics with a focus on electrostatics and electrodynamics with a particular emphasis on the characteristics of structures in the nanometer scale range.		
1 annually in the winter semester third Req. CHE 007 B	Introduction to technical macromolecular chemistry	Completion of exercises yes 3
	Introduction to technical chemistry L 0.75 Introduction to macromolecular chemistry L 1.25	
Intended learning results: Students understand the basic principles of technical and macromolecular chemistry.		
1 annually in the winter semester third Req. CHE 031	Organic chemistry of nanomaterials	written final module examination yes 6
	Organic chemistry of nanomaterials L 3 Exercises in organic chemistry of nanomaterials PC 1	
Intended learning results: Students have mastered advanced knowledge of organic synthesis, organic nanomaterials, and modification of nanomaterials with organic substances.		
1 annually in the winter semester third Req. CHE 033	Laboratory course in basic principles of chemistry	Completion of internship no 6
	Laboratory course in basic principles of chemistry I 5 Accompanying seminar on laboratory course in basic principles of chemistry S 1	
Intended learning results: Students are able to solve practical problems of an inorganic, preparative organic, and analytical nature as well as understand theoretical principles. Students have obtained key qualifications combined with chemistry content (particularly in methodology skills, work planning, social skills and team work, the creation of protocols when using chemistry software, and literature research).		
1 annually in the winter semester third Req. CHE 008	Introduction to biochemistry	written final module examination yes 3
	Introduction to biochemistry V 2	

<table>
<tr><td colspan="3">Intended learning results:
Students understand cellular structures; the basic elements of biochemistry, such as proteins, nucleic acids, lipids, and sugars; and the basic principles for proteins and nucleic acids (folding, function, catalysis).</td></tr>
<tr><td>1 annually in the winter semester third Req. PHY-N6</td><td>Quantum physics / quantum chemistry</td><td>written final module examination yes 8</td></tr>
<tr><td></td><td>Quantum physics / quantum chemistry L 4
Exercises in quantum physics / quantum chemistry PC 2</td><td></td></tr>
<tr><td colspan="3">Intended learning results:
Students have been introduced to the concepts of quantum theory and statistical physics. Students are able to apply the learned rules and regularities to problems and experiments in atomic, molecular, and solid-state physics.</td></tr>
<tr><td>1 annually in the winter semester third Req. Inf-Nano</td><td>Informatics for nanosciences</td><td>final module examination yes 5</td></tr>
<tr><td></td><td>Principles of programming and algorithms L 2
Exercises in principles of programming and algorithms PC 2</td><td></td></tr>
<tr><td colspan="3">Intended learning results:
Students possesses basic programming skills related to the natural sciences.</td></tr>
<tr><td>1 every semester fourth E PHY-N-ABK</td><td>General professional skills</td><td>As specified by the teaching staff no 3</td></tr>
<tr><td></td><td>As specified by the teaching staff L, S, PC</td><td></td></tr>
<tr><td colspan="3">Intended learning results:
• Students posses and can apply basic key skills and general work-related skills, abilities, and methods, in particular:
• computer applications
• foreign language proficiency
• communication skills
• presentation and lecturing techniques</td></tr>
</table>

• social skills and the ability to work in a team.		
1 every semester fourth, fifth, sixth RE	Required elective area physics/chemistry	As specified by the teaching staff yes 24
	As specified by the teaching staff L, S, PC	
Intended learning results: • Students possess in-depth basic knowledge of the physics and chemistry fields. • Students should follow their inclinations and interests. • The only requirement is that a workload of 24 ECTS credits be completed. • This number of ECTS credits can be earned by combining a range of modules.		
1 annually in the summer semester fourth Req. CHE 034	Nanochemistry I	written final module examination yes 4
	Nanochemistry I L 2 Exercises in nanochemistry I PC 1	
Intended learning results: Students possess knowledge and skills in the field of nanochemistry and relevant methods as well as their application to research and technology.		
1 annually in the summer semester fourth Req. CHE 035	Practice in nanochemistry	Completion of internship yes 6
	Practice in nanochemistry I 7 Accompanying seminar to nanochemistry laboratory course S 1	
Intended learning results: Students are able to independently solve practical problems related to the synthesis of nanostructures and materials and understand their theoretical principles. Students have obtained key qualifications combined with nanochemistry content (particularly in methodology skills, work planning, social skills and team work, the creation of protocols when using chemistry software, and literature research).		
1 annually in the summer semester fourth Req. PHY-N3	Nanostructure physics A	written final module examination yes 8

	Nanostructure physics A	L	4			
	Exercises in nanostructure physics A	PC	2			
Intended learning results: Students know basic and advanced concepts of the solid-state and nanostructure physics of semiconductor-nanostructures						
1 annually in the winter semester fifth Req. PHY-N4	Nanostructure physics B			written final module examination	yes	8
	Nanostructure physics B	L	4			
	Exercises in nanostructure physics B	PC	2			
Intended learning results: Students know basic and advanced concepts of the solid-state and nanostructure physics of metallic and dielectric nanostructures.						
1 annually in the winter semester fifth Req. CHE 036	Nanochemistry II			written final module examination	yes	4
	Nanochemistry II	L	2			
	Exercises in nanochemistry II	PC	1			
Intended learning results: Students possess in-depth knowledge and skills in the field of nanochemistry and relevant methods as well as their application to research and technology.						
1 annually in the winter semester fifth Req. PHY-N5	Laboratory course in nanostructure physics			Completion of internship	yes	8
	Laboratory course in nanostructure physics	I	7			
	Accompanying seminar to nanostructure physics laboratory course	S	1			
Intended learning results: • Students are familiar with the technology of a nanostructure laboratory. • Students can use the main nanostructuring techniques and relevant analytics. • Students are able to interpret and present measurement data. • Students are able to solve practical problems in nanostructure physics.						

<table>
<tr><td colspan="3">Students have obtained key qualifications combined with physics content (particularly in work planning, literature research, methodology skills, social skills and team work, the creation of protocols, and giving scientific presentations).</td></tr>
<tr><td>1 annually in the winter semester sixth Req. PHY-N- H</td><td>Herbstschule</td><td>project completion no 3</td></tr>
<tr><td></td><td>As specified by the teaching staff L, S, PC 2</td><td></td></tr>
<tr><td colspan="3">Intended learning results:
Students have met with nanoscience students from other universities.
Students are able to assess technology in terms of occupational safety, user health, environmental compatibility, and disposal/recycling.
Students are able to use academic specialist literature and database systems.
Students are familiar with the main presentation forms.
Students are able to plan their careers.</td></tr>
<tr><td>1 every semester sixth E</td><td>Free elective area</td><td>As specified by the teaching staff yes 9
determined by provider</td></tr>
<tr><td></td><td>As specified by the teaching staff L, S, PC</td><td></td></tr>
<tr><td colspan="3">Intended learning results:
Students have basic knowledge of a specialist field outside of physics and chemistry.
There are no restrictions in the choice of the subject area; students should follow their inclinations and interests.
The only requirement is that a workload of 9 ECTS credits be completed.
ECTS credits may be earned by combining various modules that have a logical connection to each other.</td></tr>
<tr><td>1 every semester sixth Req. PHY-N-BA</td><td>Final module: Bachelor’s thesis</td><td>written thesis (five-sixths) yes 12
and colloquium (one-sixth)</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td colspan="3">Intended learning results:</td></tr>
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<table>
<tr><td colspan="5">Students are familiar with a research topic of limited scope, which they subsequently research and assess. Students can document results in writing, utilizing appropriate illustrations and diagrams. Students can present and defend their findings in a seminar presentation and subsequent academic debate. Students are familiar with the techniques of scientific work and possess professional expertise and methodology skills in literature research, working with and developing information, documentation, and ultimately the presentation and discussion of scientific issues.</td></tr>
<tr><td>1 annually in the winter semester fifth RE PHY-N6</td><td colspan="3">Computational nanoscience</td><td>written final module examination yes 8</td></tr>
<tr><td></td><td>Computational nanoscience
Exercises in computational nanoscience</td><td>L
PC</td><td>4
2</td><td></td></tr>
<tr><td colspan="5">Intended learning results:
Students are familiar with fundamental problems in physics.
Students are able to transfer physics problems into numerical algorithms.</td></tr>
<tr><td>1 annually in the winter semester fifth RE PHY-E4</td><td colspan="3">Solid-state physics</td><td>written final module examination yes 7</td></tr>
<tr><td></td><td>Solid-state physics
Exercises in solid-state physics</td><td>L
PC</td><td>4
2</td><td></td></tr>
<tr><td colspan="5">Intended learning results:
Students have an overview of results from experimental solid-state physics and their interpretation in the context of theoretical models.</td></tr>
<tr><td>1 annually in the winter semester fifth RE PHY-E5</td><td colspan="3">Nuclear and particle physics</td><td>written final module examination yes 7</td></tr>
<tr><td></td><td>Nuclear and particle physics
Exercises in nuclear and particle physics</td><td>L
PC</td><td>4
2</td><td></td></tr>
<tr><td colspan="5">Intended learning results:
Students have an overview of results from experimental solid-state physics and their interpretation in the context of theoretical models.</td></tr>
<tr><td>1 annually in the summer semester fourth, sixth RE PHY-E6</td><td colspan="3">Atoms, molecules and laser physics</td><td>written final module examination yes 7</td></tr>
<tr><td></td><td>Atoms, molecules and laser physics</td><td>L</td><td>4</td><td></td></tr>
</table>

	Exercises in atoms, molecules and laser physics PC 2	
Intended learning results: Students have an overview of the methods and results of experimental atomic, molecular, and laser physics and their interpretation in the context of theoretical models.		
1 annually in the winter semester fifth RE PHY-T1	Theoretical mechanics and electrodynamics	written final module examination yes 9
	Theoretical mechanics and electrodynamics L 4 Exercises in theoretical mechanics and electrodynamics PC 2	
Intended learning results: • Students know the generalized principles and formulations of classical physics. • Students are able to mathematically describe mechanical systems within the context of Lagrangian formalism. • Students are able to identify symmetries of physical systems. • Students understand the implication of Lorentz invariance for electromagnetic phenomena.		
1 annually in the summer semester fourth, sixth RE PHY-T2	Quantum mechanics I	written final module examination yes 9
	Quantum mechanics I L 4 Exercises in quantum mechanics I PC 2	
Intended learning results: • Students are able to treat nonrelativistic quantum mechanics systematically. • Students understand the fundamental extension of physical conceptualization compared to classical physics. • Students are able to mathematically describe quantum mechanical systems.		
1 annually in the winter semester fifth RE PHY-T3	Statistics and thermodynamics	written final module examination yes 9
	Statistics and thermodynamics L 4 Exercises in statistics and thermodynamics PC 2	

<table>
<tr><td colspan="3">Intended learning results:

Students are able to treat statistical and phenomenological thermodynamics and quantum statistics systematically.
Students understand the concept of a statistical ensemble.
Students understand the relationship between classical thermodynamics and statistical physics.
Students are able to mathematically describe macroscopic phenomena based on microscopic properties.
</td></tr>
<tr><td>1 every semester fourth, fifth, sixth RE PHY-PS</td><td>Physics introductory seminars</td><td>final module examination yes 3</td></tr>
<tr><td></td><td>Introductory seminar I IS 2</td><td></td></tr>
<tr><td colspan="3">Intended learning results:

Students are able to work independently with scientific texts with physics content.
Students are able to search systematically for relevant literature.
Students are able to deliver structured oral and, as appropriate, written presentations on sophisticated topics in the field of physics.

Additional learning results:

Students possess in-depth presentation techniques and are able to use different media in a complementary manner.
Students have well-developed oral and written communication skills within the context of a subject-related discussion and a written paper.
Students are able to handle criticism.
</td></tr>
<tr><td>1 annually in the winter semester fourth, sixth RE
CHE 010</td><td>Inorganic chemistry II</td><td>written final module examination yes 6</td></tr>
<tr><td></td><td>Inorganic chemistry II L 3
Exercises in inorganic chemistry II PC 1</td><td></td></tr>
<tr><td colspan="3">Intended learning results:
Students understand the fundamentals of solid-state chemistry, the chemistry of materials, and instrumental solid-state analytics.</td></tr>
<tr><td>1 every semester fourth, fifth, sixth RE CHE 014 L</td><td>Inorganic chemistry practice</td><td>Completion of internship no 6</td></tr>
</table>

	Introduction to laboratory techniques and basic organic chemistry practice L 0.5 Inorganic chemistry practice I 5.5	
Intended learning results: Students have practical skills and abilities in preparative organic work, applying work and safety regulations; have mastered analytical methods and scientific documentation; and have in-depth theoretical knowledge of organic chemistry subject matter.		
1 annually in the winter semester fourth, sixth RE CHE 016	Inorganic chemistry III	written final module examination yes 6
	Inorganic chemistry III L 3 Exercises in inorganic chemistry III PC 1	
Intended learning results: Students possess an in-depth understanding of complex chemistry, molecular chemistry, and the main groups of organometallic chemistry.		
1 annually in the winter semester fourth, sixth RE CHE 018	Law and toxicology	written final module examination yes 3
	Law L 1 Toxicology L 1	
Intended learning results: Students have been awarded the certificate of competence in accordance with Section 5 of the chemical prohibition ordinance (Verordnung über Verbote und Beschränkungen des Inverkehrbringens und über die Abgabe bestimmter Stoffe, Gemische und Erzeugnisse nach dem Chemikaliengesetz, ChemVerbotsV), possess the basic legal knowledge required for study and professional practice, and are familiar with basic toxicology knowledge.		
1 annually in the summer semester fourth, sixth RE CHE 021 A	Biochemistry lecture module	written final module examination yes 6
	Biochemistry / molecular biology L 2	

	Analytical biochemistry S 2	
Intended learning results: Students know structure, function, and cellular structures of the general building blocks of biochemistry such as proteins and nucleic acids.		
1 every semester fourth, fifth, sixth RE CHE 021 B	Biochemistry laboratory module	oral examination yes 6
	Biochemistry practice I 5	
Intended learning results: Students are familiar with current protein analysis and molecular biology methods and are able to solve practical biochemistry and molecular biology problems.		
1 annually in the summer semester fourth, sixth RE CHE 022 A	Macromolecular chemistry lecture module	written final module examination yes 6
	Macromolecular chemistry L 3 Exercises in macromolecular chemistry PC 1	
Intended learning results: Students possess an in-depth understanding of the synthesis and characteristics of macromolecular chemistry (e.g., polymer processing).		
1 every semester fourth, fifth, sixth RE CHE 022 B	Macromolecular chemistry laboratory module	oral examination yes 6
	Macromolecular chemistry practice L 6	
Intended learning results: Students are able to solve practical problems in macromolecular research.		
1 annually in the summer semester sixth RE CHE 134	Quantum chemistry I	written final module examination yes 6
	Quantum chemistry I L 2 Exercises in quantum chemistry I PC 2	
Intended learning results: Students know the fundamentals of theoretical chemistry and quantum chemistry, particularly the Hartree-Fock theory.		