

**Degree Program and Examination Regulations for the Bachelor's  
Degree Program in Integrated Life Sciences – Biology, Biomathematics and Biophysics (BSc ILS) and the Master's Degree Program  
in Integrated Life Sciences – Biology, Biomathematics and Biophysics (MSc ILS)  
at the Faculty of Sciences of  
Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU)**

**– FPO BAMA ILS 2023 –  
Dated August 22, 2023**

Based on Section 9 (1) in conjunction with Section 80 (1)(1), Section 84 (2)(1), Section 88 (9), Section 90 (1)(2) and Section 96 (3) Bavarian Higher Education Innovation Act dated August 5, 2022 (**BayHIG**), FAU enacts the following degree program and examination regulations:

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**Part 1: General provisions**

**Section 41 Scope**

The degree program and examination regulations for the Bachelor's degree program in Integrated Life Sciences – Biology, Biomathematics and Biophysics (BSc ILS) and

the Master's degree program in Integrated Life Sciences – Biology, Biomathematics and Biophysics (MSc ILS) supplement the current version of the General Degree Program and Examination Regulations for Bachelor's and Master's Degree Programs at the Faculty of Sciences at FAU (**ABMPO/NatFak**).

#### **Section 42 Bachelor's Degree Program, Degrees in Equivalent Subjects**

(1) <sup>1</sup>The Bachelor's degree program in ILS shall consist of modules worth 180 ECTS credits distributed over six semesters. <sup>2</sup>This includes the period for working on the Bachelor's thesis.

(2) <sup>1</sup>Bachelor's degrees in biomathematics or biophysics are considered equivalent degree programs within the meaning of Section 28 (1) (2) **ABMPO/NatFak**. <sup>2</sup>Due to considerable differences, especially in the area of the mathematics modules, the Bachelor's degree program in Biology at the Faculty of Sciences at FAU explicitly does not count as an equivalent degree in this context.

#### **Section 43 Master's Degree Program, Equivalent Degree Programs, Start of Degree Program, Teaching and Examination Language**

(1) <sup>1</sup>The Master's degree program in ILS builds on the contents of the Bachelor's degree program in ILS. <sup>2</sup>It consists of modules worth 120 ECTS credits including the Master's thesis, distributed over four semesters.

(2) The Master's degree program may be started in the winter semester or in the summer semester.

(3) Section 4 (4) **ABMPO/NatFak** applies with the proviso that the teaching and examination language is English and that individual teaching units and examinations may be held in German; otherwise, Section 4 (4) **ABMPO/NatFak** shall remain unaffected.

#### **Section 44 Examinations Committee**

<sup>1</sup>The Examinations Committee for the Bachelor's and Master's degree programs in ILS shall consist of three members in total, one each from the departments of Biology, Physics and Mathematics. <sup>2</sup>The chairperson, their deputy and the other member of the Examinations Committee shall be appointed by the Faculty Council of the Faculty of Sciences based on the recommendation of the departments of Biology, Physics and Mathematics.

### **Part II: Special Provisions**

#### **1. Bachelor's Examination**

##### **Section 45 Structure of the Bachelor's Degree Program**

(1) <sup>1</sup>The Bachelor's degree program in ILS consists of compulsory, compulsory elective and elective modules. <sup>2</sup>The distribution across the semesters, the type and duration of the examinations in the modules and the required number of ECTS credits are set forth in **Appendix 1**.

(2) <sup>1</sup>Compulsory modules are all modules in **Appendix 1** with the exception of the compulsory elective modules pursuant to Section 47 and the elective module in key qualifications that can be chosen from all key qualification modules offered at FAU.

(3) Taking additional modules or participating in teaching units with a limited number of participants is only possible if capacity allows; students who require these modules as proof of gaining the 180 ECTS credits required for completing their degree are given priority.

#### **Section 46 Grundlagen- und Orientierungsprüfung (GOP)**

(1) The Grundlagen- und Orientierungsprüfung (GOP) shall consist of the following modules:

- ILS-M1 Mathematics for integrated life sciences I (7.5 ECTS credits)
- ILS-P1 Foundations of experimental physics (5 ECTS credits)
- ILS-B1 Foundations of cell biology and genetics (7.5 ECTS credits)

(2) The GOP shall have been passed when all modules listed in (1) have been evaluated as “bestanden” (passed) or given a grade of at least “ausreichend” (sufficient).

#### **Section 47 Compulsory Elective Modules**

(1) <sup>1</sup>Students may choose between the following compulsory elective modules as stipulated in Section 45 (2):

1. Compulsory elective module in biophysics
2. Compulsory elective module in computational biology (part 1 and part 2)
3. Compulsory elective module in molecular biology (part 1 and part 2).

<sup>2</sup>Two of the three possible compulsory elective modules must be chosen.

(2) <sup>1</sup>The compulsory elective module in physical biology worth 15 ECTS credits includes a lecture with laboratory course in which students learn the theory and practice of methods and procedures used in biophysics. <sup>2</sup>The compulsory elective module in computational biology parts 1 and 2 consists of a module part 1 (lecture and tutorial) and part 2 (lecture with tutorial and laboratory course), each worth 7.5 ECTS credits, and which each have to be taken in combination with one another. <sup>3</sup>The module in computational biology teaches the basics of the modeling of molecular biological systems, from statistical thermodynamics to Brownian motion. <sup>4</sup>It provides an introduction to the programming language C and its application in the numerical solution of biological problems. <sup>5</sup>The compulsory elective modules in molecular biology each consist of a module part 1 (lecture with seminar) worth 5 ECTS credits and a module part 2 (practical part with seminar) worth 10 ECTS credits, which each have to be taken in combination with one another. <sup>6</sup>The compulsory elective modules in molecular biology are equivalent to the subject modules described in Section 46 of the degree program and examination regulations for the Bachelor's degree program in Biology (BSc Biology) and the Master's degree program in Cell and Molecular Biology (MSc ZMB) (**FPO BAMA Bio**). <sup>6</sup>A number of different modules may be taken as compulsory elective modules in molecular biology, in which students learn the theory and practice of various methods used in molecular biology and apply them to various topics.

(3) <sup>1</sup>Possible examination achievements pursuant to Section 6 (3) and (4) **AB-MPO/NatFak** in the compulsory elective module in molecular biology (part 2) are either a written examination (45 min) or an oral examination (20 min), each combined with a practical achievement (PA, series of reports 20-40 pages) and/or a seminar achievement (SA, presentation 30 min); Section 6 (2)(3) **ABMPO/NatFak** shall remain unaffected. <sup>2</sup>The individual partial achievements are either incorporated in equal parts into the final grade for the module or in the ratio 60:40 or 80:20; the Examinations Committee can agree other weightings at the beginning of the semester; further details are

stipulated in the module handbook. <sup>3</sup>Otherwise, the type and scope of the examination are stipulated in **Appendix 1**.

(4) <sup>1</sup>The Examinations Committee shall decide on any deviations or accept compulsory elective modules other than those stated in (1) upon the student's request. <sup>2</sup>A compulsory elective module can only be admitted if it is compatible with the learning outcome of the Bachelor's degree and the subject is taught by a professor. <sup>3</sup>If other compulsory elective modules are admitted, deviations from the provisions stipulated in (3) and **Appendix 1** may be possible within the framework of Section 6 (3) and (4) **ABMPO/Nat-Fak**.

### **Section 48 Bachelor's Thesis**

(1) Students are required to have achieved at least 90 ECTS credits in order to be allocated a subject for the Bachelor's thesis.

(2) <sup>1</sup>The Bachelor's thesis module accounts for a total of 15 ECTS credits, with 12 ECTS credits allocated to the written Bachelor's thesis and 3 ECTS credits to the oral examination. <sup>2</sup>Requirements for the Bachelor's thesis module shall be such that it can be completed within 12 weeks.

(3) <sup>1</sup>The Bachelor's thesis shall generally be completed at one of the departments involved in the degree program in ILS. <sup>2</sup>The chairperson of the Examinations Committee may give approval for the Bachelor's thesis to be completed in departments not involved in the degree program upon request.

(4) <sup>1</sup>All university lecturers and lecturers who have completed a habilitation and who are involved in the Bachelor's or Master's degree programs in ILS as their main occupation pursuant to Section 53 (4) **BayHIG** shall be entitled to allocate subjects for Bachelor's theses (supervisors). <sup>2</sup>The Examinations Committee shall have the right to grant and arrange exceptions.

## **2. Master's Examination**

### **Section 49 Admissions Committee for the Master's Degree Program**

<sup>4</sup>The admissions committee for the Master's degree program ILS shall consist of three members employed at FAU as their main place of employment pursuant to Section 53 (4) **BayHIG**. <sup>2</sup>Two of the members, including the chairperson, shall be university lecturers as their main occupation. <sup>3</sup>The other member shall either be a full-time or part-time university lecturer. <sup>4</sup>The chairperson shall be a member of the Biology, Physics or Mathematics department, the other two members shall each be a member of one of the other two departments, thereby ensuring that each of the three departments are represented. <sup>5</sup>The two further members and their deputies shall be appointed by the Faculty of Sciences' Faculty Council at the recommendation of the departments of Biology, Physics and Mathematics.

### **Section 50 Qualification for a Master's Degree, Certificates and Admission Requirements**

(1) <sup>1</sup>A subject-specific degree within the meaning of Section 35 (1)(1)(1) **ABMPO/Nat-Fak** is a Bachelor's degree or a Diplom degree in the subject integrated life sciences.

<sup>2</sup>Bachelor's degrees in (bio)physics and (bio)mathematics in particular shall be recog-

nized as subject-related degrees within the meaning of Section 35 (1)(1)(1) **AB-MPO/NatFak**. <sup>3</sup>Applicants with a subject-related degree shall only be admitted to the Master's degree program after passing an oral admission examination. <sup>4</sup>The minimum number of ECTS credits required in the event of a student not having yet completed their Bachelor's degree pursuant to Section 35 (3) **ABMPO/NatFak** is 135 ECTS credits.

(2) The application for admission to the qualification assessment process according to paragraph (2)(2)(3) of the **Appendix to ABMPO/NatFak** shall include proof of English language proficiency at level B2 (Common European Framework of Reference for Languages – CEFR) vantage or upper intermediate.

(3) In the oral admission examination according to paragraph (5)(3) et seq. of the **Appendix to ABMPO/NatFak**, applicants shall be evaluated according to the following equally weighted criteria:

1. Knowledge of topics and methods in the field of mathematics, physics and molecular biology (weighting 1/2)
2. The ability to find interdisciplinary connections between the subjects stated in no.1 (weighting 1/2).

### **Section 51 Scope and Structure of the Master's Degree Program**

(1) <sup>1</sup>The Master's degree program consists of compulsory modules and compulsory elective modules, which with the exception of the module ILS-MA-M1, the specialization module and the Master's thesis are split into three module groups (MG) with different subject specializations. <sup>2</sup>The module groups allow students to establish a subject-specific profile. <sup>3</sup>Two module groups from the following topic specializations must be chosen:

1. Module group 1 (MG1): Mathematical modeling and systems biology
2. Module group 2 (MG2): Bioimaging and biophysics
3. Module group 3 (MG3): Biological structures and processes

(2) <sup>1</sup>The Master's examination shall consist of the required module examinations including the Master's thesis module. <sup>2</sup>The Master's examination shall have been passed when all of the following required module examinations and the Master's thesis module – worth a total of 120 ECTS credits – have been passed according to **Appendix 2a** or **b**:

1. The compulsory module ILS-MA-M1 worth 5 ECTS credits.
2. Compulsory and compulsory elective modules from one of the possible module groups stated in (1) worth 30 ECTS credits.
3. Compulsory and compulsory elective modules from another of the three possible module groups worth 35 ECTS credits.
4. The specialization module worth 20 ECTS credits.
5. The Master's thesis module worth 30 ECTS credits.

<sup>3</sup>The distribution of the modules across the semesters, type and duration of the module examinations and the required number of ECTS credits are set forth in **Appendix 2a** and **b** and in the module handbook.

(3) <sup>1</sup>A catalog of compulsory modules and compulsory elective modules for each of the module groups which can be chosen pursuant to (1) is available as stipulated in Section 52 in conjunction with **Appendix 2a** and **b**. This catalog is drawn up by the Examinations Committee and published in the module handbook. <sup>2</sup>Students choose

their specializations by registering for the first examination. <sup>3</sup>Other compulsory elective modules can be approved by the Examinations Committee upon request, provided the contents covered are clearly related to the learning outcomes of the degree program. <sup>4</sup>If this is the case, the approved module will be added to the module handbook before lectures commence.

(4) <sup>1</sup>Before starting the Master's degree program, each student shall choose one of the full-time or part-time university lecturers from the Faculty of Sciences involved in the degree program as their main occupation pursuant to Section 53(4) **BayHIG** to act as a mentor. <sup>2</sup>Mentors shall advise students in particular on the selection of compulsory elective modules and shall help them with questions regarding their studies. <sup>3</sup>This mentoring relationship shall be maintained throughout the Master's degree program.

(5) Taking additional modules or participating in teaching units with a limited number of participants is only possible if capacity allows; students who require these modules as proof of gaining the 180 ECTS credits required for completing their degree are given priority.

## **Section 52 Learning Outcomes and Examinations in the Elective Module Groups**

(1) <sup>1</sup>The overriding learning outcomes of the module groups which can be chosen pursuant to Section 51 (1) are to allow students to gain a more advanced knowledge of selected specialist areas. <sup>2</sup>This should allow them to acquire skills of relevance to research.

(2) In module group 1 "Mathematical modeling and systems biology", interdisciplinary topics of modern biological sciences are linked with mathematical and biological methods in order for students to acquire skills predominantly in describing biological processes in mathematical terms and in systems biology.

(3) In module group 2 "Bioimaging and biophysics", interdisciplinary topics of modern biological sciences are combined with physical and biological methods in order for students to acquire skills predominantly in the theory and application of physical and biological methods in the imaging of biological systems.

(4) In module group 3 "Biological structures and processes", interdisciplinary topics of modern biological sciences are combined with physical and biological methods in order for students to acquire skills predominantly in theoretical, computer-aided and experimental description of biological structures (e.g. proteins, membranes).

(5) <sup>1</sup>Possible examination achievements in the compulsory elective modules in the three module groups are set out in Section 6 (3) and (4) **ABMPO/NatFak**:

1. In modules in physics or mathematics, written examination (45-90 minutes) or oral examination (30 minutes); in justified exceptional cases pursuant to Section 6 (2)(3) **ABMPO/NatFak** combinations with practical achievements are also possible (exercises or report, 15-30 pages)
2. In modules in biology, written examination (45-90 minutes) or oral examination (30 minutes); in justified exceptional cases pursuant to Section 6 (2)(3) **ABMPO/NatFak** combinations with practical achievements (PA, series of reports, 20-40 pages) or a seminar achievement (SA, presentation 30 min).

(6) <sup>1</sup>The compulsory elective modules in the module groups 1 to 3 are listed in the module handbook. <sup>2</sup>Compulsory elective modules are generally worth 5, 7.5 or 10 ECTS credits. <sup>3</sup>Modules amounting to 5 ECTS credits usually consist of a lecture (2 SWS) and a tutorial (2 SWS). <sup>4</sup>Any exceptions are detailed in the module handbook.

(7) Section 47 (4) shall apply accordingly.

### **Section 53 Master's Thesis**

(1) Students are required to have achieved at least 60 ECTS credits in order to be allocated a subject for the Master's thesis.

(2) <sup>1</sup>The Master's thesis is intended to show that the student is capable of dealing with a problem from the field of the degree program in Integrated Life Sciences – Biology, Biomathematics and Biophysics (ILS) independently and according to scientific methods within a set period, presenting the results in accordance with the standards of the field and using the correct language, and putting them in relation to current specialist literature. <sup>2</sup>It must have an international focus and be research-oriented.

(3) The Master's thesis shall generally be written in English; the Examinations Committee shall decide whether to grant exceptions.

(4) <sup>1</sup>30 ECTS credits shall be awarded for the Master's thesis. <sup>2</sup>The results of the written work (27 ECTS credits) shall be presented in a brief presentation (3 ECTS credits).

(5) Section 48 (4) shall apply accordingly.

## **Part III: Final Provisions**

### **Section 54 Legal Validity**

(1) <sup>1</sup>These examination regulations shall come into effect on the day after their publication. <sup>2</sup>They shall apply to all students who start the Bachelor's or Master's degree program in Integrated Life Sciences – Biology, Biomathematics, Biophysics (ILS) in the winter semester 2023/2024 or later. <sup>3</sup>Notwithstanding sentence 2, the rules for the module ILS 12: Phylogeny and genome analysis in the Bachelor's degree program shall also apply to students who started to study their Bachelor's degree program in winter semester 2022/2023.

<sup>1</sup>With the exception of the provision stipulated in paragraph 1 (3), students who are already studying under the previously valid degree program and examination regulations for the Bachelor's degree program in Integrated Life Sciences – Biology, Biomathematics, Biophysics (BSc ILS) and the Master's degree program in Integrated Life Sciences – Biology, Biomathematics and Biophysics (MSc ILS) at the Faculty of Sciences of Friedrich-Alexander-Universität Erlangen-Nürnberg – FPO BAMA ILS – dated October 28, 2019 shall be examined according to those regulations. <sup>2</sup>The degree program and examination regulations mentioned in sentence 1 shall become invalid as of September 30, 2027. <sup>3</sup>Examinations pursuant to the degree program and examination regulations stated in sentence 1 will be offered for the last time for the Bachelor's degree program in summer semester 2027 and for the Master's degree program in winter semester 2025/2026.

## Appendix 1: Appendix 1: Degree Program Structure for the Bachelor's Degree Program in ILS

Module name	Teaching unit	SWS (semester hours)				Total ECTS credits	Distribution of workload per semester in ECTS credits						Type and scope of examination
		L	T	P	S		1. sem.	2. sem.	3. sem.	4. sem.	5. sem.	6. sem.	
<b>ILS-M1: Mathematics for integrated life sciences I</b>	Mathematics for engineers C1: INF, ILS	4				<b>7.5</b>	5						EA: Written examination 90 min + CA: TA (ungraded)
	Tutorials for Mathematics for engineers C1: INF, ILS		2				2.5						
<b>ILS-M2: Mathematics for integrated life sciences II</b>	Mathematics for engineers C2: INF, ILS	4				<b>5</b>		3					EA: Written examination 90 min
	Tutorials for Mathematics for engineers C2: INF, ILS		2					2					
<b>ILS-M3: Stochastic modeling</b>	Stochastic modeling	4				<b>10</b>			7				EA: Written examination 90 min + CA: TA (ungraded)
	Tutorial: Stochastic modeling		2						2				
	Tutorial: Stochastic modeling				1				1				
<b>ILS-M4: Differential equation models</b>	Differential equation models	2				<b>5</b>				3			EA: Written examination 90 min
	Tutorial: Differential equation models		2							2			
<b>ILS-P1: Foundations of experimental physics 1</b>	Foundations of experimental physics 1	3				<b>5</b>	4						EA: Written examination 90 min
	Tutorial: Foundations of experimental physics 1		1				1						
<b>ILS-P2: Foundations of experimental physics 2</b>	Foundations of experimental physics 2	3				<b>7.5</b>		4					EA: EA: Written examination 90 min + CA: PA (ungraded)
	Tutorial: Foundations of experimental physics 2		1					1					
	Laboratory course: Foundations of experimental physics			2				2.5					
<b>ILS-P4: Structural physics</b>	Structural physics	4				<b>7.5</b>			5				EA: Written examination 90 min
	Tutorial: Structural physics		2						2.5				
<b>ILS-P5: Physics of biological matter</b>	Physics of biological matter	3				<b>7.5</b>				4			EA: Written examination 90 min
	Tutorial: Physics of biological matter		3							3.5			



<b>ILS-B1: Principles of cell biology and genetics</b>	Principles of cell biology and genetics	5				<b>7.5</b>	7.5						EA: Written examination 90 min
<b>ILS-B2: Molecular biology</b>	Molecular biology	3				<b>7.5</b>		3.5					EA: Written examination 90 min + CA: PA (ungraded)
	Tutorial: Molecular biology		5					4					
<b>ILS-B3: Biochemistry and physiology</b>	Biochemistry and physiology	3				<b>7.5</b>			4				EA: Written examination 90 min + CA: PA (ungraded)
	Tutorial: Biochemistry and physiology		3						3.5				
<b>ILS-B4: Cell-cell communication, signal processing and development</b>	Cell-cell communication, signal processing and development	3				<b>7.5</b>				4			EA: Written examination 90 min + CA: PA (ungraded)
	Tutorial: Cell-cell communication, signal processing, and development		3							3.5			
<b>ILS-C1: Introduction to chemistry</b>	General chemistry	4				<b>5</b>		3					EA: Written examination 120 min
	Tutorial: General chemistry		3					2					
<b>ILS-C2: Laboratory course: Chemistry</b>	Laboratory course: Chemistry			1.5		<b>5</b>		3					CA: PA (ungraded)
	Seminar on laboratory course: Chemistry				0.5			2					
<b>ILS-C3: Physical chemistry</b>	Foundations of physical chemistry	2				<b>5</b>	2.5						EA: Written examination 90 min
	Tutorial: Foundations of physical chemistry				2		2.5						
<b>ILS-I1: Optics and microscopy</b>	Optics and microscopy	1				<b>5</b>	1						EA: PA approx. 50 pages Series of reports
	Tutorial: Optics and microscopy		4				4						
<b>ILS-I2: Genome analyses and phylogeny</b>	Genome analyses and phylogeny	2				<b>5</b>			2.5				EA: Oral seminar achievement 30 min with written assignment (5-10 pages) (50 % + 50 %)
	Laboratory course: Genome analyses and phylogeny			3					2.5				
<b>ILS-I3: Molecular biophysics and structural biology</b>	Molecular biophysics and structural biology	2				<b>5</b>				3			EA: Written examination 90 min
	Tutorial: Molecular biophysics and structural biology		2							2			
<b>ILS-I4: Metabolic networks</b>	Metabolic networks	2				<b>5</b>						3	EA: Written examination 90 min

	Tutorial: Metabolic networks		2									2	
ILS-I5: Mathematical methods in bioinformatics	Mathematical methods in bioinformatics	2				5				3			EA: Written examination 90 min
	Tutorial: Mathematical methods in bioinformatics		2							2			
ILS-W1: Compulsory elective module in physical biology pursuant to Section 47	Lecture: Modern applications of biophysical methods	2				15					5		EA: oral examination 90 min (50%) + EA: PA approx. 50 pages (50%)
	Tutorial and seminar: Modern applications of biophysical methods		11								10		
ILS-W2: Compulsory elective module: Computational biology (part 1) pursuant to Section 47	Lecture: Computational biology part 1	2				7.5					3		EA: Written examination 90 min (80 %) + EA: presentation 20 minutes (20%)
	Tutorial and seminar: Computational biology (part 1)		4.5									4.5	
ILS-W2: Compulsory elective module: Computational biology (part 2) pursuant to Section 47	Lecture: Computational biology part 2	2				7.5					3		EA: Written examination 90 min
	Tutorial: Computational biology (part 2)		4.5									4.5	
ILS-W3: Compulsory elective module: Molecular biology (part 1) pursuant to Section 47 <sup>1)</sup>	Lecture with seminar	2			1	5					5		EA: Written examination 45 min
ILS-W3: Compulsory elective module: Molecular biology (part 2) pursuant to Section 47 <sup>1)</sup>	Tutorial with seminar		13			10					10		1.2)
Key qualifications <sup>3)</sup>	Depending on module	4				5						5	CA: Depending on module (ungraded) <sup>3)</sup>
Specialization module <sup>4)</sup>	Tutorial and seminar from the area in which Bachelor's thesis is written		3		1	5						5	CA: <sup>4)</sup>
Bachelor's thesis	Bachelor's oral examination					15						3	EA: Written assignment approx. 7000 words + CA: Seminar presentation approx. 20 min (ungraded)
	Bachelor's thesis												
Total SWS and ECTS credits:		64	62–64	6.5	4.5–5.5	180	30	30	30	30	30	30	
		137–140											

- <sup>1)</sup> Subject modules from the Bachelor's degree program in Biology pursuant to Section 46 (2) **FPO BAMA Bio**. The compulsory elective module in molecular biology (part 1) corresponds to the subject module (part 2) and the compulsory elective module (part 2) corresponds to the subject module (part 1).
- <sup>2)</sup> see Section 47 (3) The type and scope of the examination and its weighting when determining the grade for the compulsory elective module in molecular biology part 2 depend on the specific manner in which the respective module is taught; see module handbook for details.
- <sup>3)</sup> Courses can be selected from the range of key qualifications offered at FAU. The type and scope of the examination depend on the specific manner in which the respective module is taught and are regulated by the applicable **degree program and examination regulations** and/or the relevant module handbook.
- <sup>4)</sup> The specialization module (4 SWS) is intended to prepare students for the Bachelor's thesis and is based on taking special seminars on current research topics, seminars offered by the various subject areas (biology, biomathematics, biophysics) or a laboratory course in preparation for the Bachelor's thesis. The type and scope of the examination in the specialization module depend on the specific manner in which the respective advanced classes are taught; see module handbook for details. As a rule, a series of reports (approx. 40 pages) has to be submitted for practical achievements and a written assignment (approx. 40 pages) for a tutorial achievement.

**Key:**

L = lecture

T = tutorial

Lab = laboratory course

S = seminar

SWS = semester hours

ECTS = credits from European Credit Transfer System

CA = course achievement

EA = examination achievement

PA = practical achievement pursuant to Section 6 (4) **ABMPO/NatFak**

SA = seminar achievement pursuant to Section 6 (4) **ABMPO/NatFak**

TA = tutorial achievement pursuant to Section 6 (4) **ABMPO/NatFak**

## Appendix 2a: Degree program structure for the Master's degree program in Integrated Life Science for students beginning in the winter semester

<sup>1</sup>See Sections 51 and 52. <sup>2</sup>In the Master's degree program in Integrated Life Sciences, three module groups are offered (MG 1, MG 2 and MG 3). They each focus on a different area of specialization and allow students to establish a subject-specific profile. <sup>3</sup>Each module group includes compulsory and compulsory elective modules. <sup>4</sup>The compulsory modules are listed below in the Degree Program Structure, whilst the compulsory elective modules are stipulated in the module hand-book. <sup>5</sup>In addition, the module ILS-MA-M1, the specialization module and the Master's thesis are classed as compulsory modules in the curriculum.

Module code	Module name	Teaching unit	SWS (semester hours)				ECTS cred-its	Distribution of workload per semester in ECTS credits				Type and scope of the examination	Grade factor
			L	T	Lab	S		1. sem.	2. sem.	3. sem.	4. sem.		
Compulsory module													
ILS-MA-M1	Introduction to Statistics and Statistical Program-ming	Introduction to Statistics	2				5		2			EA: Written examination 90 min + CA: TA <sup>1)</sup>	1
		Tutorial: Introduction to statistics (problem ses-sion)		1					1.5				
		Lab class Statistical programming		1					1.5				
	Total ECTS credits						5	0	5	0	0		
Compulsory modules in module group 1: Mathematical modeling and systems biology, see Sections 51 and 52													
ILS-MA-M2	Biomathematics	Biomathematics	4				10	7				EA: Oral examination 30 min or written examina-tion 90 min <sup>2)</sup> CA: TA <sup>1)</sup>	1
		Tutorial: Biomathematics		2				3					
ILS-MA-B1	Systems biology	Systems biology	2				5	3				EA: Written examination 60 min	1
		Laboratory course: Sys-tems biology		1				2					
	Total ECTS credits						15	15	0	0	0		
Compulsory modules in module group 2: Bioimaging and biophysics, see Sections 51 and 52													
ILS-MA-I1A	Bioimaging & biophysics A	Bioimaging & biophysics I	2				7.5	2.5				EA: Written examination 90 min or oral examination 40 min <sup>2)</sup> CA: PA <sup>1)</sup>	1
		Laboratory course: Bioim-aging & biophysics I		4				5					

Module code	Module name	Teaching unit	SWS (semester hours)				ECTS credits	Distribution of workload per semester in ECTS credits				Type and scope of the examination	Grade factor
			L	T	Lab	S		1. sem.	2. sem.	3. sem.	4. sem.		
ILS-MA-I1B	Bioimaging & biophysics B	Bioimaging & biophysics II	2				7.5		2.5			EA: Written examination 90 min or oral examination 40 min <sup>2)</sup>	1
		Laboratory course: Bioimaging & biophysics II		4					5				
	Total ECTS credits						15	7.5	7.5	0	0		
Compulsory modules in module group 3: Biological structures and processes, see Sections 51 and 52													
ILS-MA-I2A	Interactions of biological macromolecules A	Interactions of biological macromolecules A	2				5	3				EA: Written examination 120 min or oral examination 60 min <sup>2)</sup> + CA: PA <sup>1)</sup>	1
		Seminar/tutorial: Interactions of biological macromolecules A		1.5		0.5		2					
ILS-MA-I2B	Interactions of biological macromolecules B	Interactions of biological macromolecules B	2				5		3			EA: Written examination 120 min or oral examination 60 min <sup>2)</sup>	1
		Seminar/tutorial: Interactions of biological macromolecules B		1.5		0.5			2				
	Total ECTS credits						10	5	5	0	0		
Compulsory elective modules in module groups 1–3													
	Module group 1 pursuant to module handbook						15–20	15-20 <sup>4)</sup>		0	See Section 52 (5)		
	Module group 2 pursuant to module handbook						15–20	15-20 <sup>4)</sup>		0	See Section 52 (5)		
	Module group 3 pursuant to module handbook						20–25	20-25 <sup>4)</sup>		0	See Section 52 (5)		
	Total ECTS credits						35–40	35–40		0			

Specialization													
ILS-MA-VM	Advanced module	Lecture, seminar, practical training in chosen subject					20			20		EA: Oral examination 30 min	1
ILS-MA-TH	Master's thesis	Master's thesis					30				30	EA: Written assignment approx. 20,000 words + CA: Seminar presentation 30 min (presentation of results)	1
	Total ECTS credits						50			20	30		
	Total semester hours and ECTS credits		3)	3)	3)	3)	120	30 <sup>4.5)</sup>	30 <sup>4.5)</sup>	30 <sup>4.5)</sup>	30		

- 1) TA or PA pursuant to Section 6 (4) **ABMPO/NatFak**. Tutorials or laboratory classes include tutorial achievements (TA) or practical achievements (PA). As a rule, these are weekly assignments which are collected in an exercise log or series of reports and then assessed. Unless stated otherwise, this is an ungraded course achievement.
- 2) The examination form of the module, i.e. written or oral, depends on the specific manner in which the module is taught in the relevant seminar and is announced at the beginning of the semester.
- 3) The total number of required semester hours (SWS) per semester depends on the individual choice of the compulsory elective modules listed in the module handbook.
- 4) Depending on the chosen module group combination (MG 1/MG 2, MG 1/MG 3 or MG2/MG3), the number of compulsory elective modules which have to be taken varies in semesters 1–3 in order to ensure a workload of 30 ECTS credits/semester. The credits required from compulsory elective modules vary in the first semester between 7.5 and 17.5 ECTS credits and between 12.5 and 20 ECTS credits in the second semester, whilst 10 ECTS credits have to be taken in the third semester.
- 5) Depending on which compulsory elective modules are taken, deviations of +/- 2.5 ECTS credits are possible during a year of study. A total of 120 ECTS credits are required in order to be awarded a Master of Science degree. The strongly modular character of the degree program may mean that a compulsory elective module has more credits than a student needs to obtain exactly 30 or 35 ECTS credits in the chosen module group combination. In this case, when calculating the final grade for the Master's degree this module grade is considered to have the weight of the number of ECTS credits which are still required and not the actual number of credits it is worth. The additional workload completed by the student can be documented in the transcript of records.

## Appendix 2b: Degree program structure for the Master's degree program in Integrated Life Science for students beginning in the summer semester

<sup>1</sup>See Sections 51 and 52. <sup>2</sup>In the Master's degree program in Integrated Life Sciences, three module groups are offered (MG 1, MG 2 and MG 3). They each focus on a different area of specialization and allow students to establish a subject-specific profile. <sup>3</sup>Each module group includes compulsory and compulsory elective modules. <sup>4</sup>The compulsory modules are listed below in the Degree Program Structure, whilst the compulsory elective modules are stipulated in the module hand-book. <sup>5</sup>In addition, the module ILS-MA-M1, the specialization module and the Master's thesis are classed as compulsory modules in the curriculum.

Module code	Module name	Teaching unit	SWS (semester hours)				ECTS cred-its	Distribution of workload per semester in ECTS credits				Type and scope of the examination	Grade factor
			L	T	Lab	S		1. sem.	2. sem.	3. sem.	4. sem.		
Compulsory module													
ILS-MA-M1	Introduction to statistics and statistical programming	Introduction to statistics	2				5	2				EA: Written examination 90 min + CA: TA <sup>1)</sup>	1
		Tutorial: Introduction to statistics (problem ses-sion)		1				1.5					
		Lab class: Statistical programming		1				1.5					
	Total ECTS credits						5	5	0	0	0		
Compulsory modules in module group 1: Mathematical modeling and systems biology, see Sections 51 and 52													
ILS-MA-M2	Biomathematics	Biomathematics	4				10		7			EA: Oral examination 30 min or written examina-tion 90 min <sup>2)</sup> CA: TA <sup>1)</sup>	1
		Tutorial: Biomathematics		2					3				
ILS-MA-B1	Systems biology	Systems biology	2				5		3			EA: Written examination 60 min	1
		Laboratory course: Sys-tems biology		1					2				
	Total ECTS credits						15		15	0	0		
Compulsory modules in module group 2: Bioimaging and biophysics, see Sections 51 and 52													
	Bioimaging & biophysics A	Bioimaging & biophysics I	2						2.5				1

Module code	Module name	Teaching unit	SWS (semester hours)				ECTS cred-its	Distribution of workload per semester in ECTS credits				Type and scope of the examination	Grade factor
			L	T	Lab	S		1. sem.	2. sem.	3. sem.	4. sem.		
ILS-MA-I1A		Laboratory course: Bioimaging & biophysics I		4					5			EA: Written examination 90 min or oral examination 40 min <sup>2)</sup> CA: PA <sup>1)</sup>	
ILS-MA-I1B	Bioimaging & biophysics B	Bioimaging & biophysics II	2				7.5	2.5				EA: Written examination 90 min or oral examination 40 min <sup>2)</sup>	1
		Laboratory course: Bioimaging & biophysics II		4				5					
	Total ECTS credits						15	7.5	7.5	0	0		
Compulsory modules in module group 3: Biological structures and processes, see Sections 51 and 52													
ILS-MA-I2A	Interactions of biological macromolecules A	Interactions of biological macromolecules A	2				5		3			EA: Written examination 120 min or oral examination 60 min <sup>2)</sup> + CA: TA <sup>1)</sup>	1
		Seminar/tutorial: Interactions of biological macromolecules A		1.5		0.5			2				
ILS-MA-I2B	Interactions of biological macromolecules B	Interactions of biological macromolecules B	2				5	3				EA: Written examination 120 min or oral examination 60 min <sup>2)</sup>	1
		Seminar/tutorial: Interactions of biological macromolecules B		1.5		0.5		2					
	Total ECTS credits						10	5	5	0	0		
Compulsory elective modules in module groups 1–3													
	Module group 1 pursuant to module handbook						15–20	15 <sup>4)</sup>		0	See Section 52 (5)		
	Module group 2 pursuant to module handbook						15–20	15-20 <sup>4)</sup>		0	See Section 52 (5)		
	Module group 3 pursuant to module handbook						20–25	20-25 <sup>4)</sup>		0	See Section 52 (5)		
	Total ECTS credits						35–40	35–40		0			



Specialization													
ILS-MA-VM	Advanced module	Lecture, seminar, practical training in chosen subject					20			20		EA: Oral examination 30 min	1
ILS-MA-TH	Master's thesis	Master's thesis					30				30	EA: Written assignment approx. 20,000 words + CA: Seminar presentation 30 min (presentation of results)	1
	Total ECTS credits						50			20	30		
	Total semester hours and ECTS credits		3)	3)	3)	3)	120	30 4,5)	30 4,5)	30 4,5)	30		

- 1) TA or PA pursuant to Section 6 (4) **ABMPO/NatFak**. Tutorials or laboratory classes include tutorial achievements (TA) or practical achievements (PA). As a rule, these are weekly assignments which are collected in an exercise log or series of reports and then assessed. Unless stated otherwise, this is an ungraded course achievement.
- 2) The examination form of the module, i.e. written or oral, depends on the specific manner in which the module is taught in the relevant seminar and is announced at the beginning of the semester.
- 3) The total number of required semester hours (SWS) per semester depends on the individual choice of the compulsory elective modules listed in the module handbook.
- 4) Depending on the chosen module group combination (MG 1/MG 2, MG 1/MG 3 or MG2/MG3), the number of compulsory elective modules which have to be taken varies in semesters 1–3 in order to ensure a workload of 30 ECTS credits/semester. The credits required from compulsory elective modules vary in the first semester between 7.5 and 17.5 ECTS credits and between 12.5 and 20 ECTS credits in the second semester, whilst 10 ECTS credits have to be taken in the third semester.
- 5) Depending on which compulsory elective modules are taken, deviations of +/- 2.5 ECTS credits are possible during a year of study. A total of 120 ECTS credits are required in order to be awarded a Master of Science degree. The strongly modular character of the degree program may mean that a compulsory elective module has more credits than a student needs to obtain exactly 30 or 35 ECTS credits in the chosen module group combination. In this case, when calculating the final grade for the Master's degree this module grade is considered to have the weight of the number of ECTS credits which are still required and not the actual number of credits it is worth. The additional workload completed by the student can be documented in the transcript of records.

#### Glossary:

Modules and types of teaching units

*Specialisation module* = Vertiefungsmodul  
*Lab class* = Rechnerübung  
*laboratory course* = praktische Laborübung  
*Master's thesis* = Masterarbeit  
*seminar* = Seminar  
*tutorial* = Übung

Abkürzungen Lehrformen:

P = Praktikum = *laboratory course*  
S = Seminar = *seminar*  
Ü = Übung oder Laborübung = *tutorial or laboratory course*  
V = Vorlesung = *lecture*  
ECTS = Credit points of the European Credit Transfer Systems  
SWS = Semesterwochenstunden (*semester hours*)

Abkürzungen Prüfungsformen:

PL = benotetete Prüfungsleistung (*graded task*)  
SL = unbenotete Studienleistung (*ungraded task*)  
pÜL = praktische Übungsleistung gemäß § 6 Abs. 4 **ABMPO/NatFak** (*method of examination for a laboratory course in pursuance of § 6 Abs. 4 ABMPO/NatFak*)  
SeL = Seminarleistung gemäß § 6 Abs. 4 **ABMPO/NatFak** (*method of examination for a seminar in pursuance of § 6 Abs. 4 ABMPO/NatFak*)  
ÜL = Übungsleistung gemäß § 6 Abs. 4 **ABMPO/NatFak** (*method of examination for a tutorial in pursuance of § 6 Abs. 4 ABMPO/NatFak*)