

# Integrated Life Sciences (ILS)

## Biology, Biomathematics and Biophysics – Master of Science

### 1. Content of the degree programme

Integrated Life Sciences (ILS) is an interdisciplinary degree programme that covers three disciplines: biology, biomathematics and biophysics. The degree programme is taught in English. ILS students gain knowledge of mathematics and physics which they use to understand and work with biological processes. The discipline has applications in sequence analysis, analysis of gene expression patterns, and the study of the complex structures of biomolecules and cells. This FAU degree programme is currently the only one of its kind in Germany and was designed on the basis of similar programmes in the USA.

It is aimed at both graduates of the ILS Bachelor's degree programme and students with Bachelor's degrees in related subjects such as biophysics. Students gain advanced knowledge and methodological skills in their chosen two of the following three areas: **mathematical modelling and systems biology, bioimaging and biophysics, and biological structures and processes**. Students receive advice when choosing their module groups and their elective modules at the beginning of their studies through a mentoring system. Further information on the ILS Master's degree programme is available in the module handbook. [3]

### 2. Structure of the degree programme

The degree programme's compulsory and elective modules are divided into three module groups (see above):

- MG1: Mathematical Modelling and Systems Biology
- MG2: Bioimaging and Biophysics
- MG3: Biological Structures and Processes

Students choose two of these three module groups and must obtain 30 ECTS credits in one group and 40 ECTS credits in the other. In addition to these two modules groups, students take one specialisation module (20 ECTS credits) and complete a Master's thesis (30 ECTS credits).

For more information on the content, structure and orientation of the Integrated Life Sciences Master's degree programme, see Appendix 1.

### 3. Admission requirements

The ILS Master's degree programme can be started each winter semester. The requirement for admission to the Master's degree programme is an undergraduate degree in a related subject.

Applicants are assessed to see whether they are qualified and suitable for the Master's degree programme in the qualification assessment process. Applicants with an average grade of 2.5 (gut – good) or better are judged qualified by the Admissions Committee. Applications for the qualification assessment process must be submitted to the Master's Office by the 15 July at the latest. Initial applications should be submitted online via the application portal 'campo'. [8]

The following documents must be submitted with the application:

- proof of the applicant's Bachelor's degree: certificate, transcript of records, diploma supplement or similar documents

- for applicants who have not yet obtained their Bachelor's degree: a transcript of records demonstrating that at least 135 ECTS credits have been obtained
- proof of English language proficiency at level B2 of the Common European Framework of Reference for Languages (CEFR)
- letter of motivation

Further information can be found in the examination regulations. [2]

### 4. Career prospects

This degree programme equips students with the knowledge and skills to work in interdisciplinary fields such as structural biology, synthetic biology, biophysics, biomathematics, cell biology and molecular biology. Graduates may find work in research at universities and other research institutions, or in the pharmaceutical industry, the food industry or biotechnology.

### 5. Addresses

#### Dean's Office of the Faculty of Sciences

<http://nat.fau.de/fakultaet/dekanat/>

Universitätsstraße 40, 91054 Erlangen,

phone: +49 9131 8522747, open Mon–Fri 9 a.m.–12 p.m.

#### Department of Biology

[www.biologie.fau.de/](http://www.biologie.fau.de/)

#### Department of Mathematics

[www.math.fau.de](http://www.math.fau.de)

#### Department of Physics

[www.physik.fau.de](http://www.physik.fau.de)

#### Study guidance

#### Department of Biology

##### Prof. Dr. Rainer Böckmann

Department of Biology, Staudtstr. 5, 91058 Erlangen

phone: +49 9131 8525409, [rainer.boeckmann@fau.de](mailto:rainer.boeckmann@fau.de)

#### Department of Mathematics

##### Dr. Maria Neuss-Radu

Department of Mathematics, Cauerstr.11 91058 Erlangen

phone: +49 9131 8567210, [neuss-radu@math.fau.de](mailto:neuss-radu@math.fau.de)

#### Department of Physics

##### Prof. Dr. Ben Fabry

Centre for Physics in Medicine and Engineering, Henkestr. 91, 91052 Erlangen

phone: +49 9131 8525610, [bfabry@biomed.fau.de](mailto:bfabry@biomed.fau.de)

#### General information (ILS)

[www.ils.studium.fau.de](http://www.ils.studium.fau.de)

For questions regarding applications:

[ils-studienberatung@fau.de](mailto:ils-studienberatung@fau.de)

#### General advice

Student Advice and Career Service (IBZ)

Schlossplatz 3, 91054 Erlangen, information desk: room 0.021

Phone: +49 9131 8523333 or +49 9131 8524444

Office hours: Mon–Wed 8.00 a.m.–4.00 p.m.

Thu 8.00 a.m.–6.00 p.m.; Fri 8.00 a.m.–2.00 p.m.

E-mail: [ibz@fau.de](mailto:ibz@fau.de)

### Examinations representative

Petra Schmitt, Halbmondstr. 6, 91054 Erlangen, room 1.035  
Phone: +49 9131 8524063, [petra.ps.schmitt@fau.de](mailto:petra.ps.schmitt@fau.de)

### 6. More information online

- [1] ILS degree programme website:  
[www.ils.studium.fau.de](http://www.ils.studium.fau.de)
- [2] Examination regulations for the ILS degree programme:  
[www.fau.de/universitaet/organisation/recht/studiensatzungen/](http://www.fau.de/universitaet/organisation/recht/studiensatzungen/)
- [3] Module handbook:  
[www.biologie.nat.fau.de/studium/im-studium/integrated-life-sciences-m-sc/module-handbook/](http://www.biologie.nat.fau.de/studium/im-studium/integrated-life-sciences-m-sc/module-handbook/)
- [4] Examinations Office:  
[www.pruefungsamt.fau.de](http://www.pruefungsamt.fau.de)
- [5] Information for students transferring from other universities:  
[www.fau.de/studium/vor-dem-studium/zugang-zum-studium/hochschulwechsel/](http://www.fau.de/studium/vor-dem-studium/zugang-zum-studium/hochschulwechsel/)
- [6] FAU course catalogue:  
[www.vorlesungsverzeichnis.fau.de](http://www.vorlesungsverzeichnis.fau.de)
- [7] Doctoral regulations:  
[www.zuv.fau.de/universitaet/organisation/recht/studiensatzungen/NAT1/PO\\_Naturwissenschaften.pdf](http://www.zuv.fau.de/universitaet/organisation/recht/studiensatzungen/NAT1/PO_Naturwissenschaften.pdf)
- [8] Information on application for Master's degree programmes:  
[www.master.fau.de](http://www.master.fau.de)
- [9] List of Master's degree programmes with admission requirements (language proficiency):  
[www.fau.de/studium/vor-dem-studium/studiengaenge/alle-studiengaenge/](http://www.fau.de/studium/vor-dem-studium/studiengaenge/alle-studiengaenge/)

**Appendix 1: Content, structure and orientation of the Integrated Life Sciences Master's degree programme**

	Title	Workload average in ECTS			
		1st sem.	2nd sem.	3rd sem.	4th sem.
<b>Module group 1: Mathematical Modelling and Systems Biology</b>					
compulsory	Introduction to Statistics and Statistical Programming		5		
	Biomathematics	10			
	Systems Biology	5			
<b>Compulsory elective modules according to the handbook (10–20 ECTS)</b>					
	Metabolic Networks II			5	
	Spatial Modelling of Metabolic Processes			10	
	Introduction to Mathematical Modelling	10		(10)	
	Partial Differential Equations for Life Sciences		5		
	Mathematical Image Processing		5		
	Stochastic Models for Life Sciences		5		
	Complex Systems I	5		(5)	
	Complex Systems II		5		(5)
	Complex Systems III			5	
	Complex Systems IV		(5)		(5)
	Developmental Biology 3: Computer simulations of embryonal pattern formation	7.5			
	Bioanalytics		7.5		
	Python Programming		5		
	Bio-Perl: Perl Programming for Biology	5	(5)		
	Sequence Analysis and Statistical Genomics		5		
<b>Module group 2: Bioimaging and Biophysics</b>					
compulsory	Introduction to Statistics and Statistical Programming		5		
	Bioimaging & Biophysics A	7.5			
	Bioimaging & Biophysics B		7.5		
<b>Compulsory elective modules according to the handbook (10–20 ECTS)</b>					
	Mathematical Image Processing		5		
	Modern Optics: Advanced Optics	5	(5)	(5)	
	Experimental Physics 3: Optics and Quantum Phenomena			7.5	
	Biological Physics	5		(5)	
	Molecular Neurophysiology		7.5		
	Methods of Modern (Confocal) Light Microscopy		5		
	Python Programming		5		
<b>Module group 3: Biological Structures and Processes</b>					
compulsory	Introduction to Statistics and Statistical Programming		5		
	Interactions of Biological Macromolecules A	5			
	Interactions of Biological Macromolecules B		5		
<b>Compulsory elective modules according to the handbook (15-25 ECTS)</b>					
	Introduction to X-ray and Neutron Scattering I	5			
	Introduction to X-ray and Neutron Scattering II		5		
	Introduction to Soft Matter and Biological Physics			5	
	Biological Physics	5		(5)	
	Ion Transport and Signal Transduction	5			
	Developmental Biology 1: Pattern Formation, Growth, and Evolution	7.5			
	Developmental Biology 2: Molecular Control of Stem Cell and Organ Differentiation		7.5		
	Developmental Biology 4: Cell Migration and Morphogenesis	7.5			
	Structural Biology 1: Protein Design and Designer Proteins	7.5			
	Structural Biology 2: Structure and Function Relationships in Biological Macromolecules		7.5		
	Python Programming		5		
<b>Specialisation</b>					
	Advanced Module			20	
	Master's thesis				30
<b>Total ECTS:</b>		<b>30</b>	<b>30</b>	<b>30</b>	<b>30</b>

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