

# Qualification goals

## M.Sc. Life Science Informatics

---

**Faculty of Computer Science  
at Deggendorf Institute of Technology**

Created by:

Prof. Dr. Melanie Kappelmann-Fenzl,  
Degree Programme Coordinator

### **Gender neutrality**

The use of double forms or other designations of female and male genders has been largely avoided in order to maintain legibility and clarity. All designations given to the various groups of university staff apply equally to all genders of the relevant groups.

---

***As of: 30 January 2026***

## Table of contents

Gender neutrality .....	1
<b>1 Objectives of the degree programme.....</b>	<b>3</b>
<b>2 Learning outcomes of the programme .....</b>	<b>4</b>
<b>3 Study objectives and qualification goals.....</b>	<b>7</b>
<b>4 Learning outcomes of modules / module objectives / objectives matrix</b>	<b>9</b>

## 1 Objectives of the degree programme

Biomedical engineering (BME) is currently considered a technology of the future and requires cooperation between engineers, scientists, computer scientists, and medical professionals. In view of demographic change, the demand for modern medical technology for diagnostics and therapy, but also for prevention and rehabilitation, will continue to rise in the coming decades. A significant amount of data will be generated in the future by molecular medicine and the now cost-effective sequencing of genomic data using *next-generation sequencing (NGS)*.

The master's degree programme in Life Science Informatics is designed to enable graduates of a relevant bachelor's or *Diplom* programme to deepen their existing knowledge in order to meet the requirements of modern research tasks in a special way. The programme is offered by the Faculty of Computer Science at Deggendorf Institute of Technology.

The programme builds on the knowledge acquired in a bachelor's or *Diplom* programme in the field of life sciences or computer science and intensifies students' knowledge of life sciences, medicine, and bioinformatics. Upon completion of the program, graduates should be qualified to work in evidence-based biomedical and scientific research. The programme focuses both on teaching application-based methods for understanding, analysing, and interpreting biomedical data sets and on ensuring barrier-free communication between medical professionals, scientists, and analysts. In addition, particularly qualified students will furthermore learn both the practical and theoretical principles needed for them to pursue a doctoral programme or work in scientific fields.

Graduates of the Life Science Informatics programme are qualified to work in the field of biomedical statistics and data analysis and are able to support scientific projects as co-scientists and work independently.

## 2 Learning outcomes of the programme

The master's degree programme in Life Science Informatics deepens and imparts knowledge of natural sciences, biomedicine, computer science, statistics, and bioinformatics, enabling students to apply the knowledge they have gained to address modern research questions. Graduates should develop an in-depth understanding of these areas in order to be able to evaluate and visualize highly complex biomedical relationships in a statistically and medically correct manner. In addition to technical and methodological skills, students should also learn social skills, such as working in intercultural and interdisciplinary teams, in order to ensure barrier-free communication between medical professionals, natural scientists, and analysts.

The areas of expertise taught to students in the master's degree programme in Life Science Informatics can be divided and described as follows:

### **Life Science module group:**

The *Life Science* module group aims to provide an in-depth understanding of the relevant aspects of biochemistry and molecular biomedicine. In order to be able to analyse biomedical and bioinformatic data professionally, a deep understanding of molecular biological and biochemical processes is required, which is taught in this module group based on the scientific fundamentals already learned in the bachelor's programme.

The goal is to provide an in-depth understanding of the relevant aspects of molecular-based diseases with a special focus on molecular pathology. In order to understand the approaches of systems medicine, students should have a broad and deep knowledge of the biochemical processes that lead to the development and progression of disease.

The practice of medicine, especially in the disciplines of pathology and human genetics, is increasingly dependent on genomics, transcriptomics, and proteomics. It is therefore essential to expand students' knowledge and skills in handling biomedical data so that they can confidently apply the scientific concepts of molecular pathology and medicine.

### **Informatics Module Group:**

The *informatics* module group aims to provide an in-depth understanding of the relevant aspects of computer-based data analytics. Upon successful completion of this module group, students will have acquired knowledge in the core areas of information technology, be confident in using programming languages, and know how to use them as tools for data analysis. Students acquire the ability to use common programming

languages for the purpose of biomedical data analysis, learn how to use (biomedical) databases and their contents, acquire the knowledge to create bioinformatic algorithms, and apply scientifically correct statistical evaluation methods. Furthermore, graduates will be familiar with the basic principles and methods of data visualization. In order to be able to analyse biomedical and bioinformatic data professionally, one needs sound (bio)statistical know-how, which is also taught within this module group.

### **Module group Research and Methodology:**

Both modern life sciences and, in particular, molecular pathology offer a wide range of different fields of application and IT-based solutions, which must be constantly expanded and improved in order to adapt them to the current state of research. Application- and practice-oriented modules within the programme are designed to prepare students for this interdisciplinary field and for the diversity of methods in data analytics. Making evidence-based decisions based on biomedical and bioinformatic knowledge are skills that every bioinformatician must possess. Modern life sciences generate amounts of data that can only be processed using bioinformatics techniques.

### **Interdisciplinary module group:**

The field of life science informatics is interdisciplinary and multi-professional in nature, combining content from the life sciences with mathematical concepts from computer science, and plays a key role in current advances in molecular biology and medicine. These core competencies are linked in this module group and the areas of application in structural biology, pharmaceutical and biotechnological research, as well as in genome, proteome, transcriptome, and metabolome analysis are taught in an application-based manner.

The interlinking of theory and practice takes place in the degree programme through exercises, guest lectures, and practical laboratory work. A central focus of the degree programme is its application-based approach, which ensures the implementation of scientific findings in current issues in biomedical research and molecular pathological diagnostics through practice-oriented teaching. The topics are prepared theoretically and applied in concrete practical examples. For example, in the modules "Biomedical Data Analysis" and "Data Visualization," analysis concepts are developed and then carried out in practice with the students. In the process, students are introduced to a guiding position at an early stage and can also learn through observation and analysis (evaluation) of other students. Theory and practice are further linked through practical

laboratory work at Deggendorf Institute of Technology in the Laboratory for Translational Biomedicine in the field of DNA, RNA, and protein analysis. The annual "Meet the Experts" lecture series brings students into active contact with professionals in the field of life sciences.

There are many different areas of application for graduates of this programme. For example, their skills can be used in data analysis, systems biology, software development, and sequence and genome analysis. The chances of finding a suitable job after successfully completing a degree in Life Science Informatics are considered to be very good due to the development of biomedical technologies. There are currently around 4.9 million jobs in the healthcare sector in Germany, all of which have a high degree of IT penetration and therefore offer attractive employment opportunities for computer science graduates with medical and scientific knowledge.

Career opportunities are particularly available at universities, pharmaceutical companies, research institutes, clinics, and in the bioinformatics and biotech industries.

### 3 Study objectives and qualification goals

Upon completion of the degree programme, students will have acquired the following knowledge, skills, and competences:

#### **Knowledge:**

- In-depth knowledge in the field of informatics and statistics;
- In-depth knowledge in the field of natural and life sciences.
- In-depth knowledge in the field of bioinformatics and life science informatics in the context of scientific research and molecular pathology;

#### **Skills:**

- Implementation of relevant IT methods and tasks to solve specific biomedical and clinical problems;
- Design and implementation of a prototype of innovative software solutions, determination of the necessary resources, development or procurement of the necessary capacity;
- Working in accordance with current bioinformatics standards;
- Conducting and presenting a comprehensive critical data analysis;
- Critical analysis of scientific research results and presentation in the form of scientific reports or scientific publications while maintaining high standards of intellectual property protection;

#### **Competences:**

- Application of terminology in the fields of chemistry, biology, medicine, and informatics. Students can apply theoretical knowledge in a practical and solution-oriented manner;
- Support, design, and implementation of various educational activities (both degree-based and certificate-based) in the fields of biomedical research, life sciences, and computer science.
- Graduates can express themselves in written and spoken English and conduct negotiations confidently in an interdisciplinary and international context; German language skills have been consolidated and expanded during the course of study, so that long-term employment within Germany is also possible;
- Application-oriented problem solving using simple and complex methods;

- Researching and interpreting scientific texts and applying them to everyday situations in the institution or company;
- Reflecting on measures and adapting them to ethical, ecological, social, and economic circumstances;
- Critically evaluating their own strengths and weaknesses as well as their effect on others. Graduates can contribute to conflict resolution and deal constructively with criticism;
- Recognizing the need for lifelong learning and acquiring the relevant skills;
- Independently formulate scientific tasks for theoretical and experimental research.

## 4 Learning outcomes of modules / module objectives / objectives matrix

Individual modules, their detailed objectives and skills to be acquired by graduates are described in the module handbooks for the bachelor's degree programme.

The following table shows the relationship between the individual modules and the objectives of the bachelor's degree programme described in the previous section.

<b>Objective matrix of the modules in the master's degree programme "Life Science Informatics"</b>												
Module	Objectives											
	Knowledge				Skills				Competences			
	Life sciences	Informatics	Research and Methodology	Interdisciplinary	Life Sciences	Informatics	Research and Methodology	Interdisciplinary	Life sciences	Informatics	Research and Methodology	Interdisciplinary
<b>Semester 1</b>												
<b>Informatics and Biomedicine</b>												
<b>Informatics</b>		xx				xx				xx		
<b>Biomedicine</b>	xx				xx				xx			
<b>Life Science I</b>	xx		x	x	xx		x	xx	xx		x	xx
<b>Informatics I</b>		xx	x			xx	x			xx	x	
<b>Biostatistics I</b>	x	x	x	xx	x	x	x	xx	x	x	x	xx
<b>Sequencing Technologies</b>	xx		x	x	xx		x	x	xx		x	x
<b>Biomedical Data Analysis</b>	x	xx	xx	xx	x	xx	xx	x	x	xx	xx	x
<b>Semester 2</b>												
<b>Life Science II</b>	xx		x	x	xx		x		xx		x	x
<b>Informatics II</b>		xx	xx			xx	x			xx	x	
<b>Biostatistics II</b>	x	x	x	xx	x	x	x	xx	x	x	x	xx
<b>Data Mining and Machine Learning</b>		xx	x	x		xx	x	x		xx	x	x
<b>Bioinformatics Algorithms and Data Structures</b>	x	x	x		x	xx	x		x	xx	x	
<b>Data Visualisation</b>		xx	x	x		xx	x	x		xx	x	x
<b>Semester 3</b>												
<b>Master's modules</b>	x	x	x	x	x	x	x	x	x	x	x	x
<b>Master's Thesis</b>			xx	xx			xx	xx			xx	xx
<b>Master's Colloquium</b>			xx	xx			xx	xx			xx	xx
<b>Master's Seminar</b>			xx	xx			xx	xx			xx	xx

**Key:** xx strong relation; x medium relation