



JACOBS
UNIVERSITY



Study Program Handbook
Medical Natural Sciences

Bachelor of Science

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1 The Medical Natural Sciences (MedNat) Study Program

1.1 Concept

Medicine is the field of applied science related to diagnosis, treatment, and prevention of disease. It encompasses a variety of health care practices evolved to maintain and restore health by the prevention and treatment of illness in human beings. At German State Universities, a considerable fraction of students are chosen from Non-EU applicants. The Medical Natural Sciences (MedNat) Major program at Jacobs University prepares students from Non-EU countries to become medical students at a German Medical School. Importantly, the program starts with teaching in English while at the time of Graduation, all MedNat Students shall be prepared for continuing studies in German, preferably at a Medical School.

1.2 Specific Advantages of the MedNat Program at Jacobs University

- The MedNat program at Jacobs University combines modules in the Natural Sciences and Medicine with intensive German classes. In the Natural sciences, modules in Organic Chemistry, Physics or Cellular Biology are taught. These are accompanied by three dedicated modules Foundations in Medicine, in which MedNat students get to know essential concepts in Biology/Physiology and Anatomy, Biochemistry, Immunology or Microbiology. The MedNat program has a strong practical component, with excellent lab courses, tutorials and seminars.
- In the first year, all MedNat courses are taught in the English language. In the second year, most lectures are still taught in English, while exercises, lab courses or tutorials are instructed in German. Since MedNat students will have further advanced their German language skills by the third year, the German language will be the medium of instruction for all classes in the third year of study.
- As future Medical Doctors trained in Germany, MedNat students will get the essential background information on Germany and its region, as well as the different stake holders in the country in a dedicated lecture towards the end of the first year. Similarly, the German healthcare system and its stakeholders are going to be introduced in another dedicated lecture in the second year. To prepare MedNat students for the entrance exams at Medical Schools, an exercise is going to be offered, which will provide hands-on experience in medical tests and interviews.
- MedNat students will perform an intensive one-term internship at a Medical School or a hospital to get inside views on the real life as a Medical Doctor. There are intensive contacts established with leading Medical Schools that will foster a smooth transition from Jacobs University to the chosen Medical School in Germany.

1.3 Program-Specific Qualification Aims

- In their studies MedNat students acquire the necessary skills and knowledge to pursue a study of Medicine afterwards.
- Throughout their studies, MedNat student acquire solid theoretical knowledge in the key natural science subjects, as well as medical fields.
- The theoretical education is complemented by practical training through exercises and comprehensive laboratory courses, which already start in the first semester. In these

courses students will not only acquire excellent technical skills, but also learn how to accurately document and analyze scientific data through the writing of lab reports and the bachelor's thesis.

- Next to intensive German language classes, special training in several modules will enable MedNat graduates to get a clear picture of how Germany and its healthcare system function. This essential information will enable MedNat graduates to smoothly start at a Medical School of their choice.

1.4 The Jacobs University Employability and Personal Development Concept

Jacobs University's educational concept aims at fostering employability which refers to skills, capacities, and competencies which transcend disciplinary knowledge and allow graduates to quickly adapt to professional contexts. Jacobs University defines employability as encompassing not just technical skills and understanding but also personal attributes and qualities enabling students to become responsible members of their professional and academic fields as well as of the societies they live in.

Graduates of JU will be equipped with the ability to find employment and to pursue a successful professional career, which means that

- graduates possess the ability to acquire knowledge rapidly, to assess information and to evaluate new concepts critically;
- graduates have communicative competences which allow them to present themselves and their ideas and to negotiate successfully;
- graduates are familiar with business-related processes and management skills and are able to manage projects efficiently and independently.

Graduates of JU will also be equipped with a foundation to become globally responsible citizens, which includes the following attributes and qualities:

- graduates have gained intercultural competence; they are aware of intercultural differences and possess skills to deal with intercultural challenges; they are familiar with the concept of tolerance;
- graduates can apply problem-solving skills in negotiating and mediating between different points of view;
- graduates can rely on basic civic knowledge and have an understanding for ethical reasoning; students are familiar with the requirements for taking on responsibility.

1.5 Career Options

The Bachelor of Science (BSc) in Medical Natural Sciences received after three successful years of study at Jacobs University Bremen is the key to a world of numerous possibilities in the life sciences but primarily forms the basis for a successful study of Medicine at a German University for students from Non-EU countries. Intensive contacts to renowned Medical Schools in Germany exist, who are interested in successful MedNat graduates for a future study of Medicine.

1.6 More Information and Contact

For more information please contact the study program coordinator:

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or visit our program website: www.jacobs-university.de/MedNat

2 The Curricular Structure

2.1 General

The undergraduate education at Jacobs University equips students with the key qualifications necessary for a successful academic, as well as professional career. By combining disciplinary depth and transdisciplinary breadth, supplemented by skills education and extracurricular elements, students are prepared to be responsible and successful citizens within the societies they work and live in.

The curricular structure provides multiple elements enhancing employability, transdisciplinarity, and internationality. The unique Jacobs Track, offered across all study programs, provides a broad range of tailor-made courses designed to foster career competencies. These include courses which promote communication, technology, business, language, and management skills. The World Track, included in the third year of study, provides extended company internships or study abroad options, and for MedNat students an internship in a Medical school. Thus students gain training on the job and intercultural experiences.

All undergraduate programs at Jacobs University are based on a coherently modularized structure, which provides students with a broad and flexible choice of study plans.

The policies and procedures regulating undergraduate study programs at Jacobs University in general can be found on the website.

2.2 The MedNat Program Structure

2.2.1 YEAR 1

The first study year of MedNat lays the foundation for future studies at a Medical School in Germany. Dedicated modules are offered in Intensive German I, Foundations in Natural Sciences and Foundation in Medicine I. MedNat Students additionally are trained in a variety of topics within the Jacobs track, with skills and methods courses.

2.2.2 YEAR 2

In the second year, MedNat students continue with Modules in Intensive German II, Cellular Biology and Foundations in Medicine II. Again, courses offered in the Jacobs track (see below) allow MedNat students to gain transdisciplinary approaches and extra skills from a wide variety of different areas.

2.2.3 YEAR 3

During their third year, students must decide on their career after graduation. In order to facilitate this decision, the fifth semester introduces two separate tracks. By default students are registered for the World Track.

1. **The World Track**

This track provides students with an extended internship and is the regular track for MedNat students. The internship program is a core element of Jacobs University's employability approach. The curriculum includes the option for a semester-long internship in a Medical School, which provides experiential learning as well as practical work experience.

For more information, please contact the Career Services Center (<http://www.jacobs-university.de/career-services/contact>).

2. **The Campus Track**

Alternatively, MedNat students who decide for a career in the Life Sciences may also opt to follow the Campus Track by continuing their undergraduate education at Jacobs, namely by selecting an additional Year 2 module in the Life Sciences during their third year.

In the sixth semester, MedNat students are offered the two modules Foundation of Medicine III and Intensive German III, which includes a preparation for the entry exams at Medical Schools. Additionally they will concentrate on their Bachelor thesis in the context of a Project/Thesis Module.

Students may also attend a set of career skills courses and events throughout their studies. These equip them with necessary skills for their 5th semester and their future career.

2.3 **The Jacobs Track**

The Jacobs Track, another stand-alone feature of Jacobs University, runs parallel to the MedNat modules across the first two study years and is an integral part of all study programs. It reflects our commitment to an in-depth methodological education, it fosters our transdisciplinary approach, it enhances employability, and equips students with extra skills desirable in your field of study. Additionally, it integrates essential language courses.

Mathematics, statistics, and other methods courses are offered to all students within a comprehensive Methods Module. This module provides students with general foundations and transferable techniques which are invaluable to follow the study content not only in the study program itself but also in related fields.

The Skills Module equips students with general academic skills which are indispensable for their chosen area of study. These could be, for example, programming, data handling, presentation skills, and academic writing, scientific and experimental skills.

The transdisciplinary Triangle Module offers courses with a focus on at least one of the areas of business, technology and innovation, and societal context. The offerings comprise essential knowledge of these fields for students from other majors as well as problem-based courses that tackle global challenges from different disciplinary backgrounds. Working together with students from different disciplines and cultural backgrounds in these courses broadens the students' horizon by crossing the boundaries of traditional disciplines.

Foreign languages are integrated within the Language Module. Communicative skills and foreign language competence foster students' intercultural awareness and enhance their employability in a globalized and interconnected world. Jacobs University supports its students in acquiring and improving these skills by offering a variety of language courses at all proficiency levels.

2.4 Modularization of the Medical Natural Sciences Program

2.4.1 Content

Year 1

There are three mandatory modules in the MedNat program as listed below.

Intensive German I (CH17-IntGermI)

Intensive German courses are offered according to the language competency of the individual student. The first of these courses is already offered a month before the official start of the term by the Goethe Institute. MedNat students who are not yet in Germany in August have the chance to take this course in the intersession between the first and the second semester. These two courses will be complemented by a lecture series on Germany and its regions which will introduce the new home country away from home. Students will not only get an introduction to Germany's geography, but also historic perspective, and an introduction to the different stakeholders and organizations in Germany. Many aspects of everyday life in Germany will also be discussed.

Foundation in Natural Sciences (CH18-FoundNat)

In this module, an introduction is provided to the principles, ideas and basics in the Natural Sciences, with emphasis on Organic Chemistry and Physics. For each of these topics, a 5 ECTS lecture will be held in the first and second semester, respectively which will feature tutorials as integral parts of the lectures. These courses are complemented by 2.5 ECTS lab courses offering practical training in key techniques applied in Organic Chemistry and Physics, respectively.

Foundation in Medicine I (CH19-FoundMedI)

Two lectures will introduce students to Biology/Physiology and Anatomy by giving a comprehensive overview about these topics. Topics will include the design and built in Medicine, covering cellular architectures, communication in multicellular organisms, organ morphology and anatomic features of the human body. Two 2.5 ECTS lab courses will complement these lectures by training students in key techniques in Molecular and Cellular Biology, and Anatomy, featuring amongst others dissection principles and techniques.

Year 2

Three mandatory modules are offered within the MedNat program.

Intensive German II (CO43-IntGermII)

As a continuation of Intensive German I, the language courses are offered according to the language competency of the individual student. These courses will be complemented by a 5 ECTS lecture series introducing the German Healthcare System (Das deutsche Gesundheitssystem). This will be a course completely taught in the German language. The different organizations and stakeholders in the medical sector in Germany will be introduced by experts from the relevant fields. This seminar will thus provide a concise overview of how healthcare is organized in Germany and provide MedNat students with all the required information to later work as medical doctors.

Cellular Biology (CO44-CelluBio)

Cell Biology is an introductory module giving a comprehensive overview about cellular structure and physiology. It will explain cellular architecture and organization and how cells need to interact and communicate in multicellular organisms. This module will thus provide insight into both, the organismal organization and specialization of cells as well as the underlying molecular processes, e.g., gene expression and intracellular transport. Two lectures are complemented by a 5 ECTS combined seminar and lab course in Histology (Histologie), offering practical training in key techniques applied in modern Histology. This German language based lab course is planned for the intersession between the 3rd and 4th semester.

Foundations in Medicine II (CO45-FoundMedII)

This addresses in two lectures Microbes and Infection, and Immunology respectively. It combines the fundamentals of microbiology with an overview about the human immune system. Students will learn how microbes act in the environment and on human health, and how scientists investigate and control microbial pathogens. The immune system will be explained and how it identifies and eliminates cancer cells, viruses, bacteria, and parasites. Immune evasion mechanisms of pathogens will be elucidated as well as therapeutic approaches. In a 2.5 ECTS lab course, students will learn to isolate, handle, characterize, and taxonomically identify microorganisms using classical and state-of-the-art technologies. This lab course in Microbiology (*Mikrobiologie*) will be taught in German, as will be the seminar Immunology (*Immunologie*), in which students train to address and solve immunological problems.

Year 3

There are two different options:

1. World Track

In the 3rd year students follow the World Track by default.

5th Semester

- Internship in a Medical School

6th Semester

- Intensive German III
- Foundations in Medicine III
- Bachelor thesis

2. Campus Track

Students who do not enter the World Track follow the Campus Track.

5th Semester

- Biomedicine
- Choose courses (5 ECTS) from the Jacobs Track

6th Semester

- Intensive German III
- Foundations in Medicine III
- Bachelor thesis

1. World Track

Internship in a Medical School

This module will provide MedNat students with an in-depth insight into everyday work in a hospital. Students will be introduced to all aspects of the practical aspects of medicine and shadow medical doctors. This module takes place during the entire semester (September to December), with no additional courses during the normal class times in the MedNat curriculum.

Intensive German III

As in the modules Intensive German I and II, the language courses are offered according to the language competency of the individual student. These courses will be complemented by a 5 ECTS seminar in which MedNat students are introduced to and trained in all aspects concerning the entry tests at German Medical Schools (Übergang ins Medizinstudium). As all third year MedNat courses, also this seminar is taught in the German language. The internship in the 5th semester requires that the first German language course takes place before the 5th semester, and the seminar is planned for the intersession between the 5th and 6th semester.

Foundation in Medicine III

This module focuses on Biochemistry (*Biochemie*) and will address in the German language, how the structure of biological molecules (proteins, sugars, lipids, nucleic acids) defines their biochemical properties and function. Students will learn the basics of metabolism, and how small drug molecules can influence them, for example in gene expression or in infectious diseases and their treatment. A lecture is complemented by a 2.5 ECTS lab course offering practical training in key techniques applied in biochemistry and molecular biology and a seminar addressing methods and techniques in forensic medicine (*Forensik*).

Bachelor thesis

The bachelor thesis of MedNat students can be carried out as practical lab work in a laboratory within the focus area HEALTH, or on a theoretical project.

2. Campus Track

Biomedicine

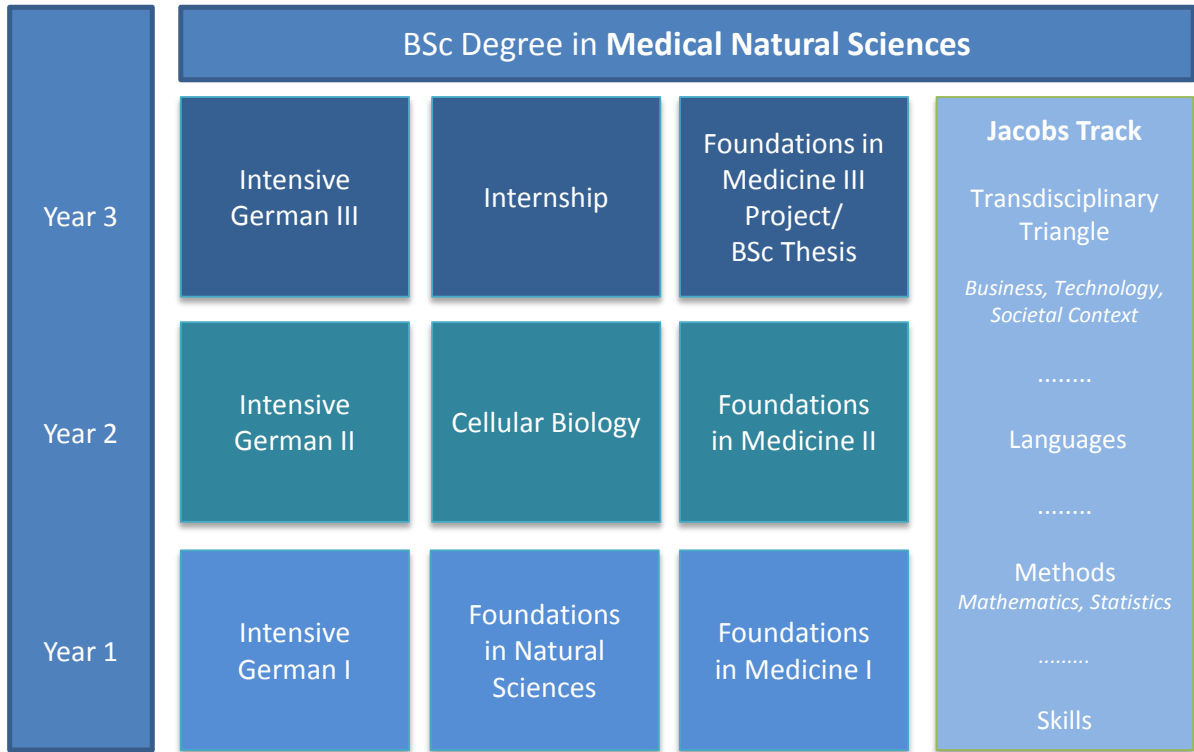
Biomedicine is an advanced module that builds on the 2nd year module Cellular Biology. Biomedicine first expands knowledge on key cellular processes often affected in diseases, e.g. gene expression, cell proliferation, intracellular trafficking, signal transduction and general turnover of cellular compounds. The module will address how these processes become altered in different diseases, e.g., cancer and neurodegenerative diseases, and how diagnostic tools and therapies (ranging from chemical to cell-based approaches) can be developed according to a disease's molecular origin. Two lectures are complemented by a 5 ECTS lab course that introduces students to modern methodology in cell biological research and biomedicine.

Additionally, choose courses (5 ECTS) from the Jacobs Track.

See World Track for:

- **Intensive German III**
- **Foundation in Medicine III**
- **Bachelor thesis**

2.4.2 Structure



YEAR 3

Alternative Campus Track option: instead of the module „Internship“ the module „Biomedicine“ and additional 5 ECTS from the Jacobs Track are required.

Figure 1: Medical Natural Sciences Module Structure

3 Requirements for a B.Sc. in Medical Natural Sciences

3.1 General Requirements

All undergraduate study programs at Jacobs University involve six semesters of study with a total of 180 ECTS (European Credit Transfer System) credits. The Bachelor's degree is designed to be achievable in three years.

The specific requirements for a degree in Medical Natural Sciences as stated below are, where applicable, complemented by the general requirements as stated in the Jacobs University Undergraduate Policy.

3.2 Requirements of the Study Program

The study program has two components: The first component includes program-specific modules. The second component provides general education modules (Jacobs Track). Detailed information on the required modules and courses is stated in the mandatory course plan.

First Component:

Program-specific Requirements (150 ECTS credits in total):

- 45 ECTS credits in program-specific 1st year modules
- 45 ECTS credits in program-specific 2nd year modules
- 25 ECTS credits in program-specific 3rd year modules
- 20 ECTS credits in the Internship Module
- 15 ECTS credits in the program-specific project/research and Bachelor thesis module

Second Component:

Jacobs Track (General Education) Requirements (30 ECTS credits in total):

- 12.5 ECTS credits in the Triangle / Language Area Module
- 15 ECTS credits in the Methods / Mathematics Module
- 2.5 ECTS credits in the Skills Module

4 Appendix 1: Mandatory Course Plan

Jacobs University Bremen reserves the right to substitute courses by replacements and/or reduce the number of mandatory/mandatory elective courses offered.

Appendix 1 - Mandatory Course Plan

Medical Natural Sciences – World Track											
Matriculation Fall 2016											
Program-Specific Modules	Type	Status ¹	Semester	Credits	Jacobs Track Modules (General Education)	Type	Status ¹	Semester	Credits		
Year 1					45						15
CH17-IntGermI	Module: Intensive German I			m	15	JT-ME-MethodsMath	Module: Methods / Mathematics			m	7,5
CH17-010101	German I	Seminar	m	1	5	JTME-120106	Applied Calculus I	Lecture	m	1	2,5
CH17-010102	German II	Seminar	m	2	5	JTME-120107	Applied Calculus II	Lecture	m	1	2,5
CH17-010103	Germany and its regions	Lecture	m	2	5	JTME-120101	Mathematical Concepts in the Sciences	Lecture	m	2	2,5
CH18-FoundNat	Module: Foundations in Natural Sciences			m	15	JT-SK-SkillsMN	Module: Skills MEDNAT			m	2,5
CH18-540101	Foundations in Organic Chemistry	Lecture	m	1	5	JT-SK-990103	Scientific and Experimental Skills	Lecture	m	1	2,5
CH18-540111	Foundations in Organic Chemistry Lab	Lab	m	1	2,5						
CH18-540102	Foundations in Physics	Lecture	m	2	5						
CH18-540112	Foundations in Physics Lab	Lab	m	2	2,5						
CH19-FoundMedI	Module: Foundations in Medicine I			m	15	JT-TA-TriLangArea	Module: Triangle / Language Area			m	5
CH19-540103	Biology/Physiology	Lecture	m	1	5		Take two courses from the triangle (BUSINESS, TECHNOLOGY and INNOVATION, SOCIETAL CONTEXT) or language area. Each counts 2,5 ECTS	me	1/2	5	
CH19-540113	MedNat Lab	Lab	m	1	2,5						
CH19-540123	Anatomy	Lecture	m	2	5						
CH19-540133	Anatomy/Physiology Lab	Lab	m	2	2,5						
Year 2					45						15
CO43-IntGermII	Module: Intensive German II			m	15	JT-ME-MethodsMath	Module: Methods / Mathematics			m	7,5
CO43-010104	German III	Seminar	m	3	5		Take three methods (mandatory) elective courses. Each counts 2,5 ECTS.	me	3/4	7,5	
CO43-010105	German IV	Seminar	m	4	5						
CO43-010106	Das deutsche Gesundheitssystem	Lecture	m	4	5						
CO44-CelluBio	Module: Cellular Biology			m	15	JT-TA-TriLangArea	Module: Triangle / Language Area			m	7,5
CH01-520122	From cells to tissue and body functions	Lecture	m	3	5		Take three courses from the triangle (BUSINESS, TECHNOLOGY and INNOVATION, SOCIETAL CONTEXT) or language area. Each counts 2,5 ECTS.	me	3/4	7,5	
CO44-540201	Histologie Labor	Lab	m	3	5						
CH01-520102	General Molecular Cell Biology	Lecture	m	4	5						
CO45-FoundMedII	Module: Foundations in Medicine II			m	15						
CO02-520233	Microbes and Infection	Lecture	m	3	5						
CO45-540211	Mikrobiologie Labor	Lab	m	3	2,5						
CO02-520322	Immunology	Lecture	m	4	5						
CO45-540202	Immunologie	Seminar	m	4	2,5						
Year 3					60						180
CA19-IntGermIII	Module: Intensive German III			m	15						
CA19-010107	German V (between 4th and 5th Semester)	Seminar	m	5	5						
CA19-010108	Übergang ins Medizinstudium (Interession)	Seminar	m	5	5						
CA19-010109	German VI	Seminar	m	6	5						
CA02-Internship	Module: Internship			m	20						
	Internship at Medical School	Internship	m	5	20						
CA20-FoundMedIII	Module: Foundations in Medicine III			m	10						
CA20-540301	Biochemie	Lecture	m	6	5						
CA20-540311	Biochemie Labor	Lab	m	6	2,5						
CA20-540302	Forensik	Seminar	m	6	2,5						
CA21-MedNat	Module: Project/Thesis MEDNAT			m	15						
CA21-540303	Project MEDNAT	Project	m	6	5						
CA21-540304	Thesis MEDNAT	Thesis	m	6	10						
Total ECTS										180	

¹ Status (m = mandatory, e = elective, me = mandatory elective)