

# UNIVERSITY AND ITS ACADEMIC CITY

## Faculty of Engineering at FAU



The Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU) offers a broad range of studies that is unique in its diversity across all of Germany. The Faculty of Engineering, being one of the five faculties at FAU, is preceded by its excellent reputation in science as well as in commerce. For more than 40 years, highly qualified engineers and computer scientists are being educated in more than 20 extremely modern and interdisciplinary study lines.

### Numbers and facts of FAU

39,628 students  
244 study programmes  
30 programmes for early studies  
Third-party funding of 171 million euros

### Numbers and facts: Faculty of Engineering

10,149 students  
20 study programmes  
6 programmes for early studies  
Third-party funding of 62.5 million euros

### City of Erlangen and region

Erlangen, a lively city full of students, open to the world and with a strong standing in economics, is situated at the center of the dynamic "Metropolis of three cities" Erlangen-Nuremberg-Fürth. With more than 100.000 inhabitants (1/3 students), Erlangen offers the ideal size for living, learning and enjoying one's time. The broad variety in the areas of cultural and leisure options opens up many possibilities for night owls as well as culture and sports enthusiasts.

For more info, see [www.erlangen.de](http://www.erlangen.de) and [www.nuernberg.de](http://www.nuernberg.de)

# INFORMATION

## Student counseling

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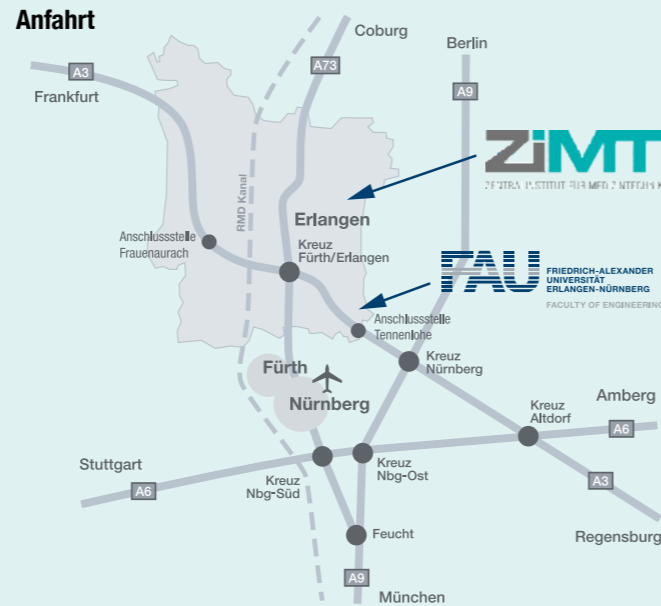


[www.tf.fau.de](http://www.tf.fau.de)  
(Faculty of Engineering)



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

### Anfahrt



For arrival by train, car or bus, please check:

[www.tf.fau.de/infocenter/campussuche](http://www.tf.fau.de/infocenter/campussuche)



Bachelor of Science (BSc) and Master of Science (MSc)

# Medical Engineering



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

# SUBJECT

## That's Medical Engineering!

Increasing progress requires innovative development and improved procedures especially in the field of medical engineering. More than ever, enterprises in the field of medical technology are in need of specialists with an engineering as well as a medical background. A specific interdisciplinary education based on solid technical and scientific studies along with basic medical knowledge about physiological processes in the human body creates the qualification for further development of medical devices and materials.

### Fields of Activity

- Further/new development of imaging techniques
- Development of highly complex devices for diagnostics and therapy
- Development and application of novel materials for implants and prosthesis
- Development of surgical robots and assisting systems

In addition to working in research, various job opportunities present themselves to graduates of healthcare engineering in locations like medical technology companies or hospitals. A specialisation on topics like development, quality control, sales, and counselling or technical service and training for the handling of medical technical devices are further important assignment areas.

### Subject Area and Study Programme in Erlangen

By winning the BMBF leading-edge cluster in January 2010, the Medical Valley European EMN (Metropolitan Region Nuremberg) demonstrated once again to be the ideal location for globally acting corporate groups and medium-sized companies in the field of medical engineering. Collaborations with non-university research facilities like the Max-Planck-Institute or the Fraunhofer Society as well as globally leading industrial enterprises like Siemens Healthineers provide opportunities to students to gain valuable experience alongside their studies in an applied and industrial environment by hands-on training or workshops. Exchange programmes with internationally leading universities in the field of medical engineering in and outside Europe complement the offered study programme in Erlangen.

## FACTS

### Requirements for Access and Enrollment

1. General or subject related (technical) qualification for university entrance
2. Passing the Aptitude Testing Procedure (EFV), deadline: July 15th.

For further information (in German) see:

[www.medizintechnik.studium.fau.de/studieninteressierte/zugang-bachelorstudium/](http://www.medizintechnik.studium.fau.de/studieninteressierte/zugang-bachelorstudium/)

3. An internship at a company prior to the course of studies is not mandatory
4. Start of courses in the winter semester, for further information see: [www.fau.eu/study/prospective-students/application-and-enrolment/deadlines-and-documents-for-enrolment](http://www.fau.eu/study/prospective-students/application-and-enrolment/deadlines-and-documents-for-enrolment)

### Structure of the University Studies

#### ■ BACHELOR STUDIES: 6 semesters

- Semesters 1-2: Basic and orientation period teaching engineering fundamentals
- Semesters 3-5: Subject-specific basics and profile formation, university practical courses, industry internships
- Semester 6: Bachelor thesis, degree: **Bachelor of Science**

#### ■ MASTER STUDIES: 4 semesters

- Semesters 1-2: Engineering core subjects, in-depth medical subjects, medical engineering core subjects, interdisciplinary competences
- Semester 3: In-depth medical engineering subjects, soft skills, laboratory internships, research internship
- Semester 4: Master thesis, degree: **Master of Science**

### Bachelor

The bachelor course of studies in Medical Engineering, with a scientific and practical approach, teaches broad, fundamental engineering knowledge combined with interdisciplinary, medical and technical experience in 6 semesters. The basic principles of medical processes, anatomical and physiological contexts as well as treatment forms in a clinical environment are part of the programme.

### Master

The master course of studies in Medical Engineering with a regular study period of 4 semesters, is a technical and research-oriented course of studies with a focus on medical solutions. It is to convey profound engineering competences and – besides specialized methodical knowledge – continuative interdisciplinary competences for qualifying in the occupational field of medical engineering. A completely English-taught branch of the master programme is offered, called “Medical Image and Data Processing” with a strong focus on programming and computer science.

## STUDY PROGRAMME MEDICAL ENGINEERING (MT)

### Bachelor Studies – Curriculum

The two branches of study “Imaging Techniques” and “Medical Devices and Prosthetics” are the ideal preparation for the master programme

#### Branch of study Imaging Techniques (electrical engineering, information technology/computer science)

Semester 1:	Semester 2:	Semester 3:	Semester 4:	Semester 5:	Semester 6:
Algorithms and data structures MT	Anatomy and physiology for non-medical students I	Anatomy and physiology for non-medical students II	Algorithms for continuous systems	Consolidation modules (15 ECTS from catalogue)	Consolidation modules (5 ECTS from catalogue)
Medical technology II	Medical technology I	Experimental physics I	Experimental physics II	Basic Biochemistry and Molecular Medicine	Softskills - Key qualifications
Mathematics for MT 1	Mathematics for MT 2	Mathematics for MT 3	Mathematics for MT 4	Sensor technology**	Seminar medical engineering
Foundations of electrical engineering I	Foundations of electrical engineering II	Laboratory	Electromagnetic fields I	Foundations of computer engineering	Research internship
	Statics and mechanics of materials	Foundations of electrical engineering III	Passive components*	Advanced programming techniques for engineers**	Bachelor's thesis
		Signals and systems I	Circuit technology*	<b>Consolidation modules, for example:</b> · Imaging techniques in medicine · Computational medicine · Software development in large-scale projects · Introduction to pattern recognition · Real-time systems	
		Healthcare information systems	Signals and systems II*		
			Foundations of system programming*		

\*hardware/software orientation I: take 2 out of 4, \*\*hardware/software orientation II: take 1 out of 2

#### Branch of study Medical Devices and Prosthetics (mechanical engineering/materials sciences/chemical & bioengineering)

Semester 1:	Semester 2:	Semester 3:	Semester 4:	Semester 5:	Semester 6:
Algorithms and data structures MT	Anatomy and physiology for non-medical students I	Anatomy and physiology for non-medical students II	Algorithms for continuous systems	Consolidation modules (15 ECTS from catalogue)	Consolidation modules (5 ECTS from catalogue)
Medical technology II	Medical technology I	Experimental physics I	Experimental physics II	Basic Biochemistry and Molecular Medicine	Softskills - Key qualifications
Mathematics for MT 1	Mathematics for MT 2	Mathematics for MT 3	Mathematics for MT 4	Quality engineering in the product development process**	Seminar medical engineering
Foundations of electrical engineering I	Foundations of electrical engineering II	Laboratory	Surfaces in biomaterials	Light in medical technology**	Research internship
	Statics and mechanics of materials	Production engineering I	Production engineering II	Fluid mechanics**	Bachelor's thesis
		Foundations of metrology	Biomechanics	Dynamics of rigid bodies**	
		Engineering drawing I	Technical thermodynamics*	<b>Consolidation modules, for example:</b> · Material science and technology of metals · Glass and ceramics · Bioreaction and bioprocess engineering · Principles of product development · Electrical drive engineering	
		Materials and their structure	Finite element methods*		

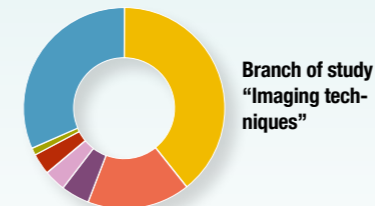
\*Specialization Medical Devices and Prosthetics I: take 1 out of 2, \*\*Specialization Medical Devices and Prosthetics II: take of a total of. 12,5 ECTS

All classes are taught in German!

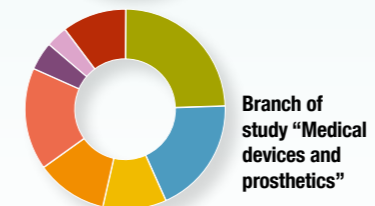
### Ratio of subjects in Bachelor studies

In the first two semesters a basic education – independent of further specification – takes place. For subject-specific profile formation specialization on one of the following branches of study takes place in the bachelor phase starting in the third semester:

- Imaging techniques (electrical engineering, information technology/computer sciences)
- Medical devices and prosthetics (mechanical engineering/materials science/ chemical and bioengineering)



Branch of study “Imaging techniques”



Branch of study “Medical devices and prosthetics”

- Electrical engineering, electronics, information technology
- Chemical and bioengineering
- Mathematics
- Physics
- Medical principles
- Materials science and material engineering
- Mechanical engineering
- Computer science

## PERSPECTIVES

### Master studies

The master programme Medical Engineering (4 semesters) can be started after successfully completing a subject-related bachelor programme. It offers interesting branches of study and the formation of one's own profile. Only one branch is taught in English!

#### ■ Medical Electronics

In the medical electronics programme, in-depth skills regarding hardware and software systems of medical devices are acquired. Fundamental knowledge of the engineering sciences in the field of electrical engineering, electronics, and information technology are the basis for this branch.

#### ■ Medical Image and Data Processing

**This branch is the only one taught 100% in English!** Deepened expertise and methodological competence about software systems in medical engineering are to be acquired. They range from basic algorithms for image enhancement, image reconstruction, image registration, and computer-based diagnosis to medical information systems.

#### ■ Medical Devices, Manufacturing Engineering, and Prosthetics

In this branch of study, the graduates gain in-depth expertise and methodological competence for construction and manufacturing of high-class medical-technical devices and implants in consideration of the interdependency with the special biological surroundings at or within the human body.

Besides obligatory and optional modules, the flexible master programme is made up of courses for personal competence build-up and of the Master's thesis. Additionally, a research internship is integrated in the curriculum, which deepens scientific work. Depending on the choice of studies – either Medical Image & Data Processing, Medical Electronics, or Medical Devices & Manufacturing – one may decide on several propositions of the particular obligatory modules of the respective course. Eventually, the M. Sc. graduation is the precondition to continue your research oriented career with a doctorate's programme.

### What about the career prospects?

The global market for medical devices is valued at approximately 200 Billion Euros at present. The growth of the market is predicted to be approx. 11%, which correlates to the average growth of sales in the past 5 years. The strong position results from the fact that approx. 10 % of all medical engineering's patents originate from Germany (number 2) and that approx. 170.000 employees are engaged in the medical engineering sector in Germany. Especially trained employees for medical engineering are still sought-after.