FRIEDRICH-ALEXANDER
UNIVERSITÄT
ERLANGEN-NÜRNBERG

TECHNISCHE FAKULTÄT

Research and studying at
FAU's Faculty of Engineering

We shape the future

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Erlangen Schloss
President's Office and
University Administration

FRIEDRICH-ALEXANDER-UNIVERSITÄT ERLANGEN-NÜRNBERG

5	FACULTIES
308	CHAIRS
579	PROFESSORS
39.780	STUDENTS (12% INTERNATIONAL)
8	KEY RESEARCH PRIORITIES AT FAU
41	RESEARCH FOCUS AREAS IN 5 FACULTIES

Founded in 1743, Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU) is one of the largest universities in Germany. It has a strong focus on research, with interdisciplinary structures across five faculties and connections to approximately 500 universities across the globe.

- **Faculty of Humanities, Social Sciences, and Theology**
- **Faculty of Business, Economics, and Law**
- **Faculty of Medicine**
- **Faculty of Sciences**
- **Faculty of Engineering**

The University has a key role in shaping the economic and social landscape of the Nuremberg Metropolitan Region, and enjoys an excellent international reputation. FAU's staff and students and their families benefit from an outstanding professional, social, cultural and international environment. There are currently nearly 40,0000 students at FAU enrolled in more than 265 traditional, interdisciplinary and international degree programmes.

Students at FAU explore the theoretical and practical aspects of their chosen subjects in depth, establishing an excellent foundation for a future career in industry or research. Numerous outstanding academic awards and excellent positions in research rankings demonstrate that FAU competes at the cutting edge of international research.

Key Research Priorities at FAU

- The World of Work
- Electronics, Analytics and Digital Transformation
- Future Energy Systems
- Cultural Values, Religions and Human Rights
- Medicine, Life Sciences and Health
- Medical Engineering
- New Materials and Processes
- Optics and Optical Technologies

Faculty of Humanities, Social Sciences, and Theology

- Work, Organisation and Learning
- Education as Transformation
- Diversity and Globalisation in the Ancient World
- Health over the Life Course
- Interdisciplinary Near East Studies
- Latin America – Diversity and Transformation
- LexicoGrammar: Description – Variation – Alteration – Cognition
- Literatures – Cultures of Knowledge – Processes of Transfer
- Human Rights/Migration
- Middle Ages and Early Modernity: Knowledge – Tradition – Practices – Imagination
- Potentials and Challenges of Digitalisation
- Religion as Practice and Discourse
- Transcultural Research on Prognosis and Decision-Making
- Knowledge – Temporality – Cultural Comparison

Faculty of Business, Economics, and Law

School of Law

- Human Rights
- Law and Religion
- Banking and Capital Markets Law

School of Business and Economics

- Customer Insights
- Tax and Tax Policy
- Insurance and Risk
- Change in the World of Work
- Digitalisation of the Economy
- Energy Markets and Energy Systems Analysis
- Health

Medizinische Fakultät

- Infection and Immunology Research
- Kidney and Vascular Research
- Neurosciences
- Tumour Research
- Medical Engineering

Faculty of Sciences

- Integrated Molecular Life Sciences
- Climate and Resources
- Modelling, Simulation and Optimisation
- New Materials and Light-Matter Interaction
- The Physics and Mathematics of the Cosmos

Faculty of Engineering

- New Materials and Processes
- Electronics and Power Engineering
- Information and Communication Technology
- Mechatronics and Production Engineering
- Optical Technologies
- Medical Engineering
- Interdisciplinary Topic: Modelling – Simulation – Optimisation

Faculty of Engineering
South Campus in Erlangen

FACULTY OF ENGINEERING

1966 FOUNDED IN 1966
5 DEPARTMENTS
3 LOCATIONS: ERLANGEN NUREMBERG FÜRTH
7 RESEARCH FOCUS AREAS
56 CHAIRS

The Faculty of Engineering at FAU is a relatively new faculty based in Erlangen with additional locations in Nuremberg and Fürth. Since the Faculty of Engineering was founded in 1966, it has gained an excellent reputation both nationally and internationally. At present it comprises five departments.

DEPARTMENTS AT THE FACULTY OF ENGINEERING

- **Chemical and Biological Engineering (CBI)**
- **Electrical, Electronic and Communication Engineering (EEI)**
- **Computer Science (INF)**
- **Mechanical Engineering (MB)**
- **Materials Science and Engineering (WW)**

The Faculty of Engineering contributes to the following FAU Key Research Priorities:

- Electronics, Analytics and Digital Transformation
- Future Energy Systems
- Medicine, Life Sciences and Health
- Medical Engineering
- New Materials and Processes
- Optics and Optical Technologies

The Faculty is guided by the principle of “unity and freedom in research and teaching” and considers this approach essential to scientific progress. The traditionally separate areas of research and teaching have evolved at FAU into the concept of “teaching from research”.

As a centre for engineering training in northern Bavaria, the Faculty of Engineering contributes to social and technological progress and offers students from Germany and abroad the perfect place to study and an ideal stepping stone for their future career in industry or research.

DEPARTMENTS AND CHAIRS

Chemical and Biological Engineering

- Advanced Optical Technologies – Thermophysical Properties
- Bioprocess Engineering
- Chemical Reaction Engineering
- Energy Process Engineering
- Particle Technology
- Medical Biotechnology
- Multiscale Simulation of Particulate Systems
- Process Machinery and Systems Engineering
- Fluid Mechanics
- Technical Thermodynamics
- Separation Science and Technology

- Erlangen Catalysis Resource Center

Electrical, Electronic and Communication Engineering

- Digital Communications
- Electrical Machines and Drives
- Electrical Energy Systems
- Energy Electronics
- Electromagnetic Fields
- Electron Devices
- Microwaves and Photonics
- Information Technology with a Focus on Communications Electronics
- Multimedia Communications and Signal Processing
- Control Engineering
- Sensor Technology
- Electronics Technology
- Reliable Circuits and Systems

- International Audio Laboratories Erlangen

DEPARTMENTS AND CHAIRS

Computer Science

- Computer Science
- Computer Science 1 IT Security Infrastructures
- Computer Science 2 Programming Systems
- Computer Science 3 Computer Architecture
- Computer Science 4 Distributed Systems and Operating Systems
- Computer Science 5 Pattern Recognition
- Computer Science 6 Data Management
- Computer Science 7 Computer Networks and Communication Systems
- Computer Science 8 Theoretical Computer Science
- Computer Science 9 Computer Graphics
- Computer Science 10 System Simulation
- Computer Science 11 Software Engineering
- Computer Science 12 Hardware Software Co-Design
- Computer Science 13 Applied Cryptography (Nuremberg Campus of Technology)
- Computer Science 14 Machine Learning and Data Analytics

- Professorship for Didactics of Informatics
- Professorship for High Performance Computing
- Professorship for Knowledge Adaption and Reasoning for Content
- Professorship for Open Source Software

- Computer Science Research Group M (Medical Informatics)

Mechanical Engineering

- Factory Automation and Production Systems
- Manufacturing Technology
- Engineering Design
- Polymer Technology
- Photonic Technologies
- Manufacturing Metrology
- Applied Dynamics
- Applied Mechanics
- Resource and Energy-Efficient Production Machines

Materials Science and Engineering

- General Materials Properties
- Materials Science and Engineering for Metals
- Glass and Ceramics
- Surface Science and Corrosion
- Polymer Materials
- Materials for Electronics and Energy Technology
- Biomaterials
- Materials Simulation
- Micro- and Nanostructure Research

Faculty of Engineering
South Campus in Erlangen

RESEARCH FOCUS AREAS

New Materials and Processes

The Faculty of Engineering is renowned for its exceptional strength in new materials research and process technologies related to this field. Its researchers collaborate in interdisciplinary projects and networks which transcend departmental and faculty research. Pivotal to this research is the development of functional and structural materials with a hierarchical structure from the molecular to the macroscopic scale. To bridge the gap between molecular design, functional particle systems and component design, new research approaches are needed covering a range of length and time scales. This applies to analysis, simulation and optimisation of structures, properties and processes, as well as the relevant manufacturing and processing technologies. Designing and investigating material surfaces is a key area in developing new approaches.

Medical Engineering

Research into medical engineering focuses on developing devices and technology for the prevention, diagnosis and treatment of diseases and promotion of health, as well as systems engineering for life sciences. Important objectives in medical engineering research include improving quality of life and health in ageing, as well as optimising cost structures in the healthcare sector. Scientists from the Faculty of Engineering make fundamental contributions to the field of medical engineering, telemedicine, biomaterials or systems engineering with innovative methods from tissue engineering, biofabrication or therapeutic and diagnostic systems. Thanks to the close collaboration with Siemens Healthineers, the Fraunhofer Innovation Cluster “Personal Health” and numerous companies in the Nuremberg Metropolitan Region, FAU offers an excellent research environment in the field of medical engineering, reflected not only in its close links to industry in this field, but also in interdisciplinary Collaborative Research Centres, Research Groups, research associations and Graduate Schools. This development recognises the increasing complexity and the intrinsic interdisciplinary quality of medical engineering. At the same time, communication and technology transfer is encouraged between engineers and doctors/medical researchers.

Interdisciplinary topic: Modelling – Simulation – Optimisation

Computer-aided modelling and simulations of real problems are increasingly replacing time-consuming, complex experiments and have become an important competitive factor. At the Faculty of Engineering, research is carried out into logical/conceptual modelling, numerical simulation using high-performance computers, discrete simulation and optimisation, often in collaboration with the Faculty of Sciences. Research in this field is carried out by several professorships and chairs in the Department of Computer Science as well as in other departments involved in the practical application of the concepts, and by the Central Institute for Scientific Computing (ZISC), which brings together the expertise of over 30 research units at FAU. Areas of application include materials science, manufacturing technology, energy systems, image processing, and mobility and communications systems, although a number of interdisciplinary projects cover more than one of these areas.

Electronics and Energy Technology

Complex electronics systems are now integral to all progressive applications in industry, mobility, energy supply and private life. Researchers at the Faculty of Engineering have been working for many years with researchers from the Fraunhofer Institutes IIS and IISB on innovative electronics systems for use in all of these areas. Their collaboration led to the establishment of the Leistungszentrum Elektroniksysteme (LZE), a centre of electronic systems that is unique in Germany. This long-term strategic partnership between FAU, Fraunhofer and industry combines research and teaching of an excellent standard with the rapid development of innovative products. FAU is one of the leading universities in the field of microelectronics for transmission technology and communication as well as the gathering and processing of data, and collaborates closely with various partners, including the Research Fab Microelectronics Germany (FMD). The LZE initiative is also one of the major leaders in Europe for power electronics. Its expertise ranges from developing basic materials (e.g. SiC), components and integration technology to developing complex power electronics systems for e-mobility and electrical power supply.

Energie Campus Nürnberg (EnCN) consolidates expertise in energy research and is staffed by scientists from FAU and the Ohm University of Applied Sciences, the Fraunhofer Institutes IIS, IISB, IBP and the Bavarian Centre for Applied Energy Research (ZAE), who are working on developing a closed renewable energy chain within a research platform. They focus in particular on producing electricity from renewable sources, various energy storage technologies, efficient consumer systems and intelligent energy management solutions. For example, new materials are being developed for solar cells and solar panels, as are methods for processing and inspecting them. What makes this research unique is the combination of sustainable energy research with approaches for converting solar power into new chemical fuels for mobile and stationary applications. All research in this area focuses on the efficiency and optimisation of processes, ranging from basic research to practical application, with simulation and modelling acting as an interface between these phases.

Optical Technologies

The 21st century has been referred to as the century of the photon, as optical technologies – known internationally as photonics – are expected to have a key role in the near future in areas such as energy, industry or medicine. Optical technologies have a long tradition at the Faculty of Engineering. Aspects of current research include modern imaging methods, laser-based additive production processes, optical metrology for combustion processes and nanomaterials, computational optics and applications for photonics in medicine.

Alongside research, the Erlangen Graduate School in Advanced Optical Technologies (SAOT) and the Bavarian Elite degree programme in Advanced Optical Technologies provide excellent training opportunities for young researchers.

Information and Communication Technology

A number of innovations throughout the world are based on ensuring an increasing volume of information can be exchanged efficiently and processed intelligently. It is perhaps, then, little wonder that information technology is considered to be one of the key technologies of the 21st century. Within the context of digital transformation, information and communication technology (ICT) has since reached nearly all areas of society.

Various components have to interact with each other in nearly all electronic devices. A knowledge of both hardware and software is required to be able to successfully develop such systems. Research in the field of information technology has even led to brand new methods

of communication, e.g. state of the art audio and video coding (home of MP3),or new ways for analysing large volumes of data. Information and communication technology combines the most important areas of electrical engineering, electronics, and information technology, as well as computer science.

Degree programmes in this area provide students with knowledge of the basic principles underlying the specification of an information and communication system, from design and implementation to testing and evaluation. Interdisciplinary technology of this nature is vital for most tasks and products in high-tech industries.

ICT technology is used, for example, in the automotive sector, for audio and video technology, smart grids, energy-efficient IT systems and medical engineering.

Mechatronics and Production Engineering

Mechatronics combines methods, tools and processes from mechanics and electrics/electronics, often involving computer science as well. A deep understanding of these subject areas and the areas where they overlap as well as a willingness to take new approaches for creating new functions in the smallest possible space is needed when designing, developing and producing innovative systems for purposes ranging from actuators to robotics or humanoids.

Production technology deals with materials in general and focuses on optimising existing production procedures and chains or finding new rational and quality-assured approaches for producing technical products, taking ecological and economical aspects into consideration. Understanding the interactions between materials, geometrical aspects and processes on the one hand and material and information flows on the other is the basis for designing models and creating predictive simulation tools.

In particular, using data from individuals, machines, products and environment in a targeted way and incorporating them into the development and production processes of innovative products offers both areas new impulses for making industry more tailored to demand and sustainability.

Faculty of Engineering
South Campus in Erlangen

RESEARCH INSTITUTIONS

Thanks to its considerable scientific potential and numerous national and international contacts and partners, FAU's Faculty of Engineering has been able to establish several research institutions which consolidate the expertise of the chairs and departments and encourage networking between different research groups.

Research institutions:

- VerTec (Centre for Additive Manufacturing)
- Bavarian Laser Centre (blz)
- EIDrive-Centre (Bavarian Technology Centre for Electrical Drives)
- Embedded Systems Institute (ESI)
- Energie Campus Nürnberg (EnCN)
- Erlangen Catalysis Resource Centre (ECRC)
- INI.FAU Ingolstadt Institute of Friedrich-Alexander-Universität Erlangen-Nürnberg
- International Audio Laboratories Erlangen (AudioLabs)
- Neue Materialien Fürth GmbH (NMF)
- Central Institute of Healthcare Engineering (ZiMT)
- Institute of Advanced Materials and Processes

EXCELLENCE INITIATIVE

FAU achieved a major success in the Excellence Initiative by the German Federal and State Governments to Promote Science and Research at German Universities. Since funding was granted in 2007, the Engineering of Advanced Materials (EAM) Cluster of Excellence has received 81.3 million euros of funding and the Erlangen Graduate School of Advanced Optical Technologies (SAOT) has received 18.8 million euros.

- Engineering of Advanced Materials (EAM)
- Erlangen Graduate School in Advanced Optical Technologies (SAOT)

ENGINEERING OF ADVANCED MATERIALS

Research at the Cluster of Excellence "Engineering of Advanced Materials" (EAM) focuses on the study and development of advanced materials for innovative applications. The research activities at EAM are divided into seven areas. Four applied research areas are organised into value chains: Nanoelectronic Materials, Photonic and Optical Materials, Catalytic Materials, and Lightweight Materials. They are complemented by three cross-sectional areas Functional Particle Systems, Nanoanalysis and Electron Microscopy, and Multiscale Modelling and Simulation. EAM thus combines expertise in fundamental research and process technology from eight FAU departments, the two Fraunhofer Institutes in Erlangen, the Max Planck Institute for the Science of Light and select industry partners.

www.eam.fau.de

ERLANGEN GRADUATE SCHOOL IN ADVANCED OPTICAL TECHNOLOGIES

At the Graduate School, renowned experts work on innovations in optical metrology, optical materials processing, optics in medicine, optics in communication and information technology, optical materials and systems and computational optics. Their results benefit a wide range of applications in research and industry. Over the past eleven years, the Graduate School has attracted several prominent researchers and young scientists from around the world to FAU.

This has resulted in currently 120 doctoral theses at the Graduate School. Even after the funding period from the Excellence Initiative has ended, FAU will continue to extend its interdisciplinary research and training programme which is firmly anchored in a wide international network and further strengthen the central role of SAOT in optical technologies at the University.

www.aot.fau.de

STUDYING AND RESEARCHING INTERNATIONALLY

Excellent research facilities and international degree programmes – people from all over the world come together to study, teach and research at FAU's Faculty of Engineering. The Faculty of Engineering is at the cutting edge of research and enjoys excellent connections to many universities throughout the world, as well as co-operating closely with industry in Germany and abroad.

Numerous international awards and prizes won by outstanding researchers and top positions in international rankings testify to the internationally competitive infrastructure at the Faculty of Engineering.

International degree programmes at the Faculty of Engineering:

- Advanced Optical Technologies (MSc), Elite degree programme
- Advanced Materials and Processes (MSc), Elite degree programme
- Advanced Signal Processing and Communications Engineering (MSc), Elite degree programme
- Bavarian Graduate School of Computational Engineering (MSc), Elite degree programme
- Computational Engineering (MSc)
- Communications and Multimedia Engineering (MSc)
- Chemical and Biological Engineering (MSc)
- Medical Engineering (MSc)

www.tf.fau.de/international/

CHEMICAL ENGINEERING AND BIOENGINEERING

CBI

www.cbi.tf.fau.de

RESEARCH FOCUS AREAS

CBI participates in the following research focus areas at FAU:

- New Materials and Processes
- Optics and Optical Technologies
- Future Energy Systems
- Medicine, Life Sciences and Health

PROFILE AND PERSPECTIVES

"Develop, optimise and provide technology and processes"
This is the aim the Department of Chemical and Biological Engineering (CBI) has been pursuing since it was founded in 1965 by the Institute for Technical Chemistry. Today, the Department is a unique combination of 11 chairs (and the interdisciplinary Erlangen Catalysis Resource Center) focusing on basic process engineering operations and the emerging engineering disciplines of process engineering and biological science. The interdisciplinary expertise found in the Department covers the challenges currently facing our society. Research conducted at the Department covers the topics of energy and resources, life sciences, digitalisation, and transport and mobility.

Prestigious awards for members of the Department (e.g. Leibniz, ERC, Excellence Initiative) reflect their excellent scientific achievements and high international standing.

Students can study process engineering in four internal consecutive Bachelor's and Master's degree programmes offered by the Department itself or as part of two inter-departmental and interdisciplinary international Master's degree programmes. The strongly research-oriented Master's degree programmes in particular are constantly evolving to reflect current topics. Excellent results in renowned international rankings, for example the QS World University Ranking 2018 and the Shanghai Ranking 2017, are testimony to the high quality of the training in production engineering offered by the Department.

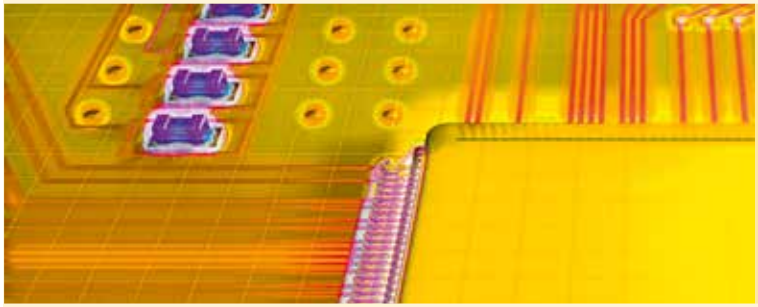
PARTNERSHIPS AND COLLABORATIONS

The Department collaborates with a large number of research institutions and industry partners, both within Germany and abroad. Within FAU, there is a strong connection to the Department of Materials Science and Engineering and the Department of Mechanical Engineering, as well as to the Faculty of Sciences. This connection is particularly visible in the "Engineering of Advanced Materials Excellence Cluster", which has been funded by the German Research Foundation (DFG) since 2007. The Department also had a leading role in establishing the Helmholtz Institute Erlangen-Nürnberg for Renewable Energy, which was founded in 2013. The cutting-edge performance of the interdisciplinary collaborations involving the Department is demonstrated by participation in Collaborative Research Centres, Priority Programmes, Research Training Groups, research groups and research networks run by the German Research Foundation (DFG), the Federal Ministry of Education and Research (BMBF) and the European Research Council (ERC). The Department regularly receives considerable commissions from industry and the public sector, totalling more than 17 million euros in 2017. According to the DFG Funding Atlas 2018, FAU was awarded considerably more DFG funding for research into process engineering and technical chemistry than any other institution.

ELECTRICAL ENGINEERING – ELECTRONICS – COMMUNICATION ENGINEERING

EEI

www.eei.tf.fau.de



RESEARCH FOCUS AREAS

EEI participates in the following research focus areas at FAU:

- Electrical engineering
- Electronic Systems
- Information and Communication Technology

PROFILE AND PERSPECTIVES

Founded in 1966, the Department of Electrical, Electronic and Communication Engineering (EEI) today comprises 13 chairs – a unique structure which makes research and teaching at Erlangen particularly attractive. Thanks to this structure, EEI can address interdisciplinary fields of research and teaching in addition to traditional subjects. EEI's teaching excellence is demonstrated by the interdisciplinary degree programmes in mechatronics, information and communication technology, power engineering, medical engineering, industrial engineering and management, and computational engineering, as well as contributions to the Cluster of Excellence "Engineering of Advanced Materials" (EAM), the Erlangen Graduate School in Advanced Optical Technologies (SAOT) and the Elite Master's degree programme "Advanced Optical Technologies" (MAOT). The Master's degree programme in Communications and Multimedia Engineering created in 2011 and the Elite Master's degree programme in Advanced Signal Processing and Communications Engineering (ASC) launched in 2016 are an important contribution to the internationalisation of the Department and its teaching. EEI's successful nomination of a candidate for an Alexander von Humboldt Professorship was an important milestone in terms of research. As the Humboldt Professorship is Germany's most prestigious international research award with the highest grant, this achievement marked an important success for the institute and the candidate while demonstrating academic excellence and promoting the University's international reputation. A further key achievement in the Department's history was founding International Audiolabs in co-operation with both Fraunhofer Institutes in Erlangen. EEI's collaboration with the Max Planck Institute in Erlangen and the Energie Campus Nürnberg (EnCN) is another example of the Department's continued success in working with external research institutes.

PARTNERSHIPS AND COLLABORATIONS

Thanks to numerous high-profile collaborations, the Department is well-established in the international research community for its focus on implementing and researching the latest technology and on attracting outstanding young researchers by offering training which is relevant to professional skills required on the labour market. The excellent quality of the chairs and departments which collaborate with EEI has been repeatedly demonstrated by Collaborative Research Centres and transfer projects, Priority Programmes and Graduate Schools such as SAOT (Erlangen Graduate School in Advanced Optical Technologies) as well as research groups and research networks from the BFS, the DFG and the Federal Ministry of Education and Research. In the last five years, the Department has raised funding of more than €140m from industry and public institutions.

Equally noteworthy is EEI's high number of internationally recognised publications, patents and awards. The research networks may be grouped into partnerships focusing on basic research (DFG, Bavarian Research Foundation), partnerships focusing on practical application (EU, ESA, BMBF, BMWi, BStWIVT), and commissioned research for industry with national and international partners. This broad range of partners and contracting parties reflects the vast array of research topics at EEI and its high potential for future developments.

COMPUTER SCIENCE

INF

www.cs.fau.de

RESEARCH FOCUS AREAS

INF participates in the following research focus areas at FAU:

- Electronics, Analytics and Digital Transformation
- Future Energy Systems
- Cultural Values, Religions and Human Rights
- Medicine, Life Sciences and Health
- Medical Engineering
- New Materials and Processes
- Optics and Optical Technologies

PROFILE AND PERSPECTIVES

The Department of Computer Science (INF) at FAU has been a driving force in the development of future technologies in the IT sector for 50 years and has continually supplied the labour market with well-trained IT experts. In today's industrial and information society, computer science has an ever-increasing significance as an interdisciplinary and integral field in engineering. The Department meets this challenge by offering a structure which is unique in Germany by collaborating closely with well-known regional and international companies, as well as university and non-university research institutions. Excellent results have already been achieved on an international level in research focus areas such as "Embedded Systems", "Medical Engineering" and "Modelling and Simulation". Future research projects will cover further innovative fields such as IT security and cryptography, computer science in automotive engineering, energy informatics, autonomous systems, data analysis, machine learning and IT in ageing societies. Many of these research areas arise from the challenges caused by social changes such as ageing societies and energy shortages. Computer science will play an essential role in solving these problems. With its current and future research focus areas, the Department is well-equipped to meet these challenges and make substantial contributions towards solving them.

PARTNERSHIPS AND COLLABORATION

INF's reputation as a research institution is demonstrated by the numerous national and international collaborations with partners from industry and research. The Department's partnerships cover the entire range of topics in computer science, focusing in particular on their socio-political significance. The Department successfully covers both basic research and applied and method-oriented research, as is demonstrated by its steady growth. It now comprises fourteen chairs, four professorships and one research group. At present, the department also offers various interdisciplinary degree programmes. In addition, the Department of Computer Science is involved in Energie Campus Nürnberg, Nuremberg Campus of Technology and the ElHome-Center.

The excellent quality of research is underpinned by its leading role in and substantial contributions to several central institutes and interdisciplinary centres at FAU, such as ESI (Embedded Systems Institute) the Central Institute of Healthcare Engineering (ZiMT) and the Central Institute for Scientific Computing (ZISC). The Department is involved in several Collaborative Research Centres (e.g. CRC/Transregio 89 "Invasive Computing" and CRC 1223 "Methods and Tools for Understanding and Controlling Privacy"), priority programmes (e.g. DFG Priority Programme 2037 "Scalable Data Management for Future Hardware") and Graduate Schools (e.g. BGCE – Bavarian Graduate School of Computational Engineering and SAOT – Erlangen Graduate School in Advanced Optical Technologies. In addition, there are numerous research groups and networks as well as research collaborations with partners from industry such as INI.FAU – a collaboration between FAU and AUDI in Ingolstadt, and Campus Future Energy Systems (FES) with Siemens.

MECHANICAL ENGINEERING

MB

www.mb.tf.fau.de

RESEARCH FOCUS AREAS

MB is involved in the following research focus areas at FAU:

- Medical Engineering
- New Materials and Processes
- Mechatronics and Production Engineering
- Optical Technologies
- Information and Communication Technology

PROFILE AND PERSPECTIVES

The Department of Mechanical Engineering (MB) was founded in 1982 as the "Institute for Manufacturing Technology". Since then, it has proven to be a highly dynamic unit and has gained a reputation as a successful national and international research institution and a qualified partner for industry with regard to technology and knowledge transfer. At present, the Department comprises nine chairs and some 300 employees. The Department is responsible for the degree programme "Mechanical Engineering", which is the most subscribed programme at the Faculty of Engineering. Further highly successful degree programmes include "Industrial Engineering and Management" and "International Production Engineering and Management" which attract large numbers of students. The Department's research activities focus on the development of methods and technology in future-oriented fields of mechanical engineering. Special areas of expertise within the Department include production technology with a focus on polymer technology, metal forming technology, production technology automation, metrology, modelling and integrated product development with numerical simulation. At the same time, the Department is committed to sustainability and aims to meet the challenges of today's society. In line with the research focus areas and Key Research Priorities defined by the University and the faculties, the Department has identified mobility, health, communication and energy as key fields in which mechanical engineering can make a significant contribution.

PARTNERSHIPS AND COLLABORATION

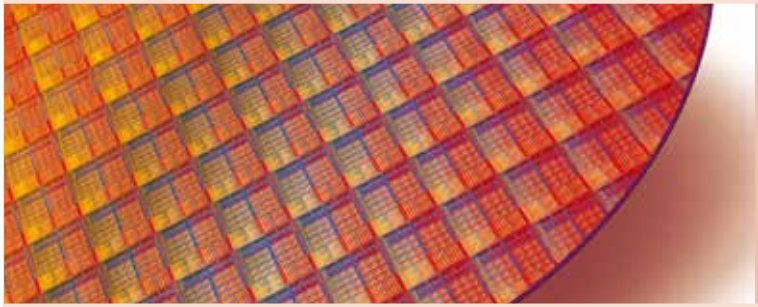
The Department of Mechanical Engineering has a variety of collaborations with external partners. These range from long-term institutional memberships with associations and alliances such as CIRP, WGP, WLT and GAMM which result in close collaboration with external partners to national and international research projects and associations, many of which run over several years. Examples include projects funded by the Bavarian Research Foundation, the DFG and the EU. Projects requiring specialist expertise often call for collaboration between two or more scientific partners, as with FAU's Ingolstadt Institute (INI.FAU). Thanks to joint research projects and the Erasmus/Socrates student exchange programmes, FAU has established links to over 60 international universities for exchanging research and offering academics and students the opportunity to gain international experience. By working closely with over 100 companies – in some cases for many years – the Department ensures that research is application-orientated and that knowledge is transferred between the University and industry.

In 2017, the Department raised third-party funding of more than 18m euros (excluding institutions such as the Bavarian Laser Centre and the Central Institute for New Materials in Fürth) – this amounts to approximately 30% of the entire third-party funding received by the Faculty of Engineering. Particularly successful projects include Collaborative Research Centre 814 "Additive manufacturing", Transregio 73 "Sheet-bulk metal forming" and the "Advanced Investigators Grant" MOCOPOLY of the European Research Council.

MATERIALS SCIENCE AND ENGINEERING

www.ww.tf.fau.de

WW



RESEARCH FOCUS AREAS

WW participates in the following research focus areas at FAU:

- New Materials and Processes
- Medical Engineering
- Future Energy Systems
- Optics and Optical Technologies

PROFILE AND PERSPECTIVES

With nine chairs and 18 professorships, the Department of Materials Science and Engineering is the largest university department of its kind in Germany. Nearly one third of all German experts in materials science and engineering have been educated in Erlangen in the past decades. It is the only materials science department in Germany to offer training and research opportunities in all material groups from traditional construction materials to modern functional materials including aspects from natural sciences and engineering relevant to materials science. Research in the area of biomaterials has added a further interdisciplinary aspect to the work of the Department, moving towards medicine and medical engineering. The broad spectrum offered by the Department is reflected in its three main research focus areas “New Materials and Processes”, “Multi-scale Modelling and Characterisation” and “High Performance Materials for Mobility, Energy and Life Sciences”. Neue Materialien Fürth GmbH, the Institute of Advanced Materials and Processes in Fürth and ZAE Bayern (Bavarian Centre for Applied Energy Research) open up excellent opportunities for technology transfer and interdisciplinary research activities in the field of materials applications. The Bavarian Polymer Institute (BPI) with the key laboratory “Advanced Fiber Technologies” is also based in Fürth. The Cluster of Excellence ‘Engineering of Advanced Materials’ (EAM), funded by the German Research Foundation (DFG), provides a university-wide platform for excellent interdisciplinary research into new materials and processes. Within this framework, a Center for Nanoanalysis and Electron Microscopy (CENEM) has been established, the only one of its kind in Germany, which develops and provides cutting-edge microscopic techniques for materials research. A valuable contribution is made by doctoral candidates from the DFG-funded research training group RTG 1896 ‘In situ microscopy’, in which four chairs at the department are involved. In addition, the Interdisciplinary Centre for Nanostructured Films (IZNF) is currently under construction, a product of the EAM platform which aims to extend the expertise of FAU to the area of functional thin film technology. Another joint project funded by the DFG is CRC 103, focusing on monocrystalline superalloys. They are a key factor in the development of gas power plants, solar thermal plants and aircraft engines. In 2011, a demonstration centre for additive manufacturing was founded (“VerTec”) which produces prototypes in collaboration with industry. Another project worth mention is CRC/TR 225 “From the foundations of biofabrication to functional tissue models”. The speaker for Erlangen comes from the Department, which contributes to the CRC with a total of four sub-projects. The Department is also very successful in the Emerging Fields Initiative (EFI) at FAU, with two leading applications having been approved so far (TopBioMAT, MoJo-3D).

PARTNERSHIPS AND COLLABORATION

The outstanding international reputation of Materials Science and Engineering at FAU is reflected by the many national and international collaborations and research initiatives with partners in research and industry, for example CRC 814 “Additive manufacturing” and CRC/TR 225 “Biofabrication”. They are involved in interdisciplinary projects together with the Faculty of Sciences and Faculty of Medicine and Universitätsklinikum Erlangen, in the Interdisciplinary Centre for Interface-Controlled Processes and in the EU project FunGLASS – Centre for Functional and Surface-functionalized Glasses. This strong interdisciplinary focus is reflected by the Department’s involvement in the FAU Key Research Priorities.

DEGREE PROGRAMMES IN ENGINEERING AND COMPUTER SCIENCE

Degree programmes at the Faculty of Engineering aim to equip graduates with the skills they need for their future careers, whether they choose to go into academic research or work in today's society and economy with its emphasis on research and knowledge. Many of the degree programmes offered by the Faculty involve an intensive exchange with the Faculty of Sciences, the Faculty of Business, Economics, and Law and the Faculty of Medicine.

TRADITIONAL DEGREE PROGRAMMES (BSc / MSc)

- Chemical Engineering and Bioengineering
- Electrical, Electronic and Communication Engineering
- Computer Science*
- Mechanical Engineering*
- Materials Science and Engineering

INTERDISCIPLINARY DEGREE PROGRAMMES (BSc / MSc)

- Teaching Engineering in Vocational Schools (MEd) (specialisations: metals technology; electrical engineering and information technology)
- Chemical Engineering – Sustainable Chemical Technologies
- Communications and Multimedia Engineering (MSc)
- Computational Engineering
- Energy Technology
- Information and Communication Technology*
- Computer Science/IT Security (degree programme for working professionals, BSc)*
- International Production Engineering and Management (Bsc)*
- Teaching computer science for all school types (state examination)
- Life Science Engineering
- Mechatronics*
- Medical Engineering (specialisations: Medical Electronics and Medical Image and Data Processing; Medical Equipment Technology; Production Technology and Prosthetics)
- Nanotechnology
- Information Systems
- Industrial Engineering and Management* (specialisations: mechanical engineering and electrical engineering)

*Fast-track option available for school pupils (www.fruehstudium.fau.de)

MASTER'S DEGREE PROGRAMMES WITHIN THE BAVARIAN ELITE NETWORK

- Advanced Signal Processing and Communications Engineering (MSc)
- Advanced Materials and Processes (MSc)
- Advanced Optical Technologies (MSc)
- Bavarian Graduate School of Computational Engineering (MSc)

ALUMNI ASSOCIATION OF THE FACULTY OF ENGINEERING (ATE)

ALUMNI NETWORK

ATE was founded in 2002 as a knowledge and career network, bringing together those with close ties to the Faculty of Engineering across the generations. Along with alumni and Faculty staff, friends and supporters from industry and politics play an active role in the association. All students are introduced to the network when they start their degrees. Since 2011, the Friends of the Faculty of Engineering (a prominent group of financial supporters) has been included in the constitution of the ATE as part of the Faculty's alumni association, allowing both parties to share resources and objectives.

Activities
The ATE offers various opportunities to participate in the Faculty of Engineering:

- ATE scholarship
- Doctoral awards
- Mentoring
- ATE yearbooks and reunions
- Company visits
- Presentations, information events and workshops
- Newsletter
- Alumni Portal and Alumni Community on XING

www.alumnite.de

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