

## UNIVERSITY & SURROUNDINGS

### Faculty of Engineering



Friedrich-Alexander University Erlangen-Nürnberg (FAU) offers a range of subjects that is unique in its diversity in Germany. The Faculty of Engineering is one of FAU's five faculties and has an excellent reputation in science and industry. For more than 40 years, highly qualified engineers and computer scientists have been graduating from more than 20 modern and interdisciplinary degree programmes and six Master's programmes taught in English.

#### Facts and figures about FAU

> 40.000 Students  
 263 Degree programs  
 6 Elite degree programs within The Elite Network of Bavaria  
 30 Programs for early-entrance students

#### Facts and figures about the Faculty of Engineering

> 11.000 Students  
 31 Degree programs  
 4 Elite degree programs within The Elite Network of Bavaria  
 6 Programs for early-entrance students

### Erlangen and the region

Erlangen is a cosmopolitan, economically strong, and vibrant student city located in the Nuremberg Metropolitan Region. With more than 100,000 inhabitants (a third of which are students), Erlangen has the ideal size for social life, studies and relaxation. The diversity of events and leisure activities in the region leaves nothing to be desired by night owls, culture connoisseurs and sports fans. More information available at: [www.erlangen.de](http://www.erlangen.de) and [www.nuernberg.de](http://www.nuernberg.de)

## INFORMATION

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



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

### Location



To reach us by plane, car, train or bus, please visit:  
[www.techfak.uni-erlangen.de/infocenter/campussuche](http://www.techfak.uni-erlangen.de/infocenter/campussuche)



## International Master Programme Advanced Signal Processing and Communications Engineering **ASC**



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

## AREA OF STUDIES

### This is "ASC"

Since fall 2016 the Faculty of Engineering at Friedrich-Alexander University Erlangen-Nürnberg (FAU) offers the international Elite Master's Degree Programme 'Advanced Signal Processing and Communications Engineering' (ASC). ASC is a 4-semester M.Sc. within the Elite Network of Bavaria taught in English and designed for holders of outstanding Bachelor's degrees in Electrical Engineering, Communications Engineering, Computer Science, Applied Mathematics or closely related disciplines. This Elite Master's programme is characterised in particular by advanced specialist training, intensive individual supervision of outstanding national and international students ('high potentials'), early introduction of students to international cutting-edge research, an international outlook and the core skills it imparts to participants.

### Fields of action

ASC is focusing on concepts for advanced technologies in the areas of signal processing and communications such as: information theory, coding, statistical signal processing, machine learning, pattern recognition, optimization and game theory. Students deepen the broad interdisciplinary scope of these topics choosing from various areas of specialization.

- advanced technologies in the areas of signal processing and communications
- machine learning for image recognition, audio and video
- next-generation wireless systems (mobile and pervasive networks)
- intelligent networks (Smart Grids)
- distributed optimization and computing

### ASC and the local Metropolitan Region

According to the Shanghai ranking, FAU Erlangen-Nürnberg is first in Telecommunications Engineering within Germany. The ASC programme is embedded into this stimulating engineering school at FAU and is greatly enriched by the direct involvement of the International Audio Laboratories – a joint research unit of Fraunhofer IIS ('Home of the mp3') and the university. With numerous high-profile and world-renowned R&D institutions for audio, multimedia, communications, and medical systems (Siemens, Fraunhofer, Alcatel-Lucent, INTEL, Qualcomm, Continental, Dolby, Medical Valley, a.o.) nearby, theory meets practice on a daily basis, thereby offering many options for complementing studies and for starting an engineering career.

## PROGRAMME INFORMATION

### Application and Admission

1. Entry requirement: Outstanding Bachelor Degree (completed or to be completed soon)
2. Start of programme: winter term (starting October)
3. Selection process: ASC screening process and admission by the ASC admission board
4. Formal admission by the Master's Office of the University
5. Application deadline: for students subject to / exempt from visa requirements: April 15 / July 15, respectively.

### General programme structure

#### Expected BACHELOR Programme

- Electrical Engineering, Communications Engineering, Computer Science, Applied Mathematics, or closely related disciplines.
- Final average score of Bachelor's degree: at least **80%** or 2.0 in German grading system

#### M.Sc. Advanced Signal Processing and Communications Engineering: 4 semesters

- 1<sup>st</sup> & 2<sup>nd</sup> semester: deepening and widening of theoretical and practical background, German language courses for foreign speakers, technical courses, laboratories, winter and summer school
- 3<sup>rd</sup> semester: research projects including self-directed reading, attending lectures, conducting experiments and paper writing.
- 4<sup>th</sup> semester: master's thesis, degree: master of science

### Prerequisites

- Engineering math: linear algebra, complex analysis, linear differential equations, Fourier transform, Laplace transform, z-transform
- Signals and Systems (textbook, e.g., Oppenheim/Willisky, Signals and Systems)
- Communications (textbook, e.g., Haykin, Communication Systems)
- Stochastic Signals (textbook, e.g., Pillai/Papoulis: Probability, Random Variables, and Stochastic Processes)
- Software: MATLAB

## DEGREE PROGRAMME "ASC"

### Study Plan

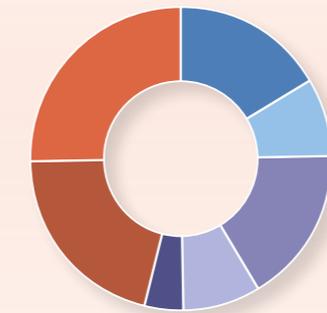
Semester 1	Semester 2	Semester 3	Semester 4
Mathematical Optimization in Communications and Signal Processing	Machine Learning in Signal Processing	Research Project (Minor)	Master's Thesis
Information Theory and Coding	Selected Topics in ASC		
Statistical Signal Processing	Nontechnical Elective Courses	Research Project (Major)	
Game Theory with Application to Information Engineering	Technical Mandatory Elective Courses	Technical Elective Courses	
Technical Mandatory Elective Courses	Elective Courses Technical Lab Courses		
Technical Lab Courses	Summer School		
Kick-off Seminar Winter School			

In future, society will face significant challenges associated with energy supply and ageing populations while digitalisation will continue to progress into all areas of life. Developing a society based on knowledge and innovation is essential to achieving economic competitiveness and sustainable development. Communications and multimedia technology will play a key role in every area of society, particularly for achieving goals of this nature. The purpose of the ASC Elite Master's programme is to make a decisive contribution towards this objective by providing individualised training to particularly outstanding students.

Digital engineers in Germany will exert a decisive influence on the ongoing rapid pace of technological progress and the high rate of innovation in information and communications technology and its applications, in particular with regard to the emerging fifth generation (5G) of mobile communications systems and the Internet of Things.

Cyber physical systems will play a central role in the worlds of business and everyday life. Their task will be to log, evaluate and communicate information collected from the environment, in particular multimedia content. Data needs to be protected against interference and eavesdropping to enable the transfer and distribution of ever greater amounts of information. Massive multi-antenna technology, the latest progress in wireless communications, is used for this purpose and subject to extensive research. Data evaluation will be fully automated by means of advanced machine learning algorithms. Students participating in the ASC Elite Master's programme play an active role in all these future-orientated fields of research.

### ECTS Distribution in Master's Programme



#### Lectures and Courses

- Mandatory Modules
- Interdisciplinary Modules
- Technical Electives
- Soft-Skills, Non-Technical Electives
- Labs

#### Research

- Research Projects
- Master Thesis

Intensive and personalised supervision is considered decisive to the success of high-potential students and this is therefore an intrinsic part of the degree programme. Each ASC student is assigned an individual mentor from the ASC teaching body as personal contact partner for the entire duration of the degree programme to ensure the greatest possible quality of education and training. All ASC-courses are taught in English and do not require prior knowledge in German language.

### Research and Teaching Environment

When the preparation of the profile of the ASC Elite Master's programme was undertaken, excellence criteria for research and teaching were defined. ASC is driven by the Institute of Digital Communications, the Chair of Multimedia Communications and Signal Processing, the Chair of Electronics, the Pattern Recognition Lab, the Chair of Computer Networks and Communication Systems, the Chair of Hardware-Software-Co-Design, the Chair of Economic Theory and the Chair of Economics – Discrete Optimization – Mathematics. ASC is also tightly linked to the International Audiolabs Erlangen, a joint research institute of the university and the Fraunhofer IIS. All lectures are taught by internationally recognized tenured faculty, including five IEEE Fellows and recipients of numerous other national and international awards.

## FURTHER INFORMATION

### Career Prospects

We aim to ensure programme graduates have an advanced level of personal development, in-depth knowledge of communication and multimedia technology, are able to employ well-structured academic working methods and have the core skills that will ensure they can be considered as the 'brightest minds' and 'high potentials' who merit appointment to executive posts in business and science.

ASC graduates will advance technological progress as disseminators in leadership positions with managerial responsibility in business and science and contribute sustainably towards societal prosperity.

Furthermore the qualification provided by the ASC Elite Master's programme constitutes an outstanding starting point for acquiring a subsequent doctorate in the shortest possible time.

### International Students

- Scholarships:** Student jobs for all ASC-students are guaranteed to cover their cost of living, the average income being around €730 monthly.
- Tuition Fees:** There is no tuition fee at FAU but every student should pay € 114 per semester for student services and a semester ticket. Using the semester ticket, students can use bus transportation in Nuremberg, Erlangen and Fürth on weekends and also during the weeks from 7pm to 6am. They can promote their tickets to full time coverage by paying an extra fee.
- Visa:** Before coming to Germany you need to check the visa requirements for your case. For further information see the Visa Information provided by DAAD.
- Residence Permit:** If you are interested in complementing your financial resources by working in Germany, a working permit for student jobs or internships is quite easy to obtain.
- Health Insurance:** In Germany you will generally need to be covered by health insurance. Several major insurance companies have branch offices in Erlangen.
- Accommodation:** Accommodation in Erlangen costs between €250 to €400 monthly per person, depending on the size and type of room or apartment. The FAU accommodation support helps students to find an appropriate accommodation.
- Costs of Living:** The minimum monthly cost of living (including accommodation and health insurance costs) in Erlangen is about €650 to €800.