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**

- 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, Doby, Medical Valley, etc.) nearby, theory meets practice on a daily basis, thereby offering many opportunities for complementing studies and for starting an engineering career.

**ASC and the local Metropolitan 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 and www.nuernberg.de
### 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
  - 1st & 2nd semester: deepening and widening of theoretical and practical background, German language courses for foreign speakers, technical courses, laboratories, winter and summer school
  - 3rd semester: research projects including self-directed reading, attending lectures, conducting experiments and paper writing.
  - 4th semester: master’s thesis, degree: master of science

### Prerequisites

- **Engineering math:** linear algebra, complex analysis, linear differential equations, Fourier transform, Laplace transform, z-transform
- **Probability:** Stochastic Signals (textbook, e.g., Pillai/Papoulis: Probability, Communications (textbook, e.g., Haykin, Communication Systems)
- **Engineering:** engineering: 4 semesters
  - 1st semester: deepening and widening of theoretical and practical background, German language courses for foreign speakers, technical courses, laboratories, winter and summer school
  - 2nd semester: deepening and widening of theoretical and practical background, German language courses for foreign speakers, technical courses, laboratories, winter and summer school
  - 3rd semester: research projects including self-directed reading, attending lectures, conducting experiments and paper writing.
  - 4th semester: master’s thesis, degree: master of science

### 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 the 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 communication technologies 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 world of business and everyday life. Their task will be to log, evaluate and communicate information collected, and 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 IESE.

### Research and Teaching Environment

Intensive and personalized 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 their success and well-being. ASC students 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.

### Further Information

#### ECTS Distribution in Master’s Programme

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
<th>Semester 3</th>
<th>Semester 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematical Optimization in Communications and Signal Processing</td>
<td>Machine Learning in Signal Processing</td>
<td>Research Project (Minor)</td>
<td>Master’s Thesis</td>
</tr>
<tr>
<td>Information Theory and Coding</td>
<td>Selected Topics in ASC</td>
<td>Research Project (Major)</td>
<td></td>
</tr>
<tr>
<td>Statistical Signal Processing</td>
<td>Technical Mandatory Elective Courses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Game Theory with Application to Information Engineering</td>
<td>Technical Elective Courses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technical Mandatory Elective Courses</td>
<td>Elective Courses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technical Lab Courses</td>
<td>Technical Lab Courses</td>
<td>Summer School</td>
<td></td>
</tr>
</tbody>
</table>

#### Programmes

- **M.Sc. Advanced Signal Processing and Communications Engineering:** 4 semesters
- **Bachelor Programme in Electrical Engineering, Communications Engineering, Computer Science, Applied Mathematics, or closely related disciplines.**

#### Cost of Living: The minimum monthly cost of living (including accommodation) in Erlangen is about €650 to €800.

#### Career Prospects

- **International Students**
  - **Scholarships:** Student jobs for all ASC-students are guaranteed to cover their cost of living, the average income being around €750 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 7am. 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 branches 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.

- **International Students**
  - **Scholarships:** Student jobs for all ASC-students are guaranteed to cover their cost of living, the average income being around €750 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 7am. 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 branches 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.

#### Lectures and Courses

- **Mandatory Modules**
- **Interdisciplinary Modules**
- **Technical Electives**
- **Soft Skills, Non-Technical Electives**
- **Life Research**
- **Research Projects**
- **Master Thesis**