HELMUT SCHMIDT
UNIVERSITÄT
Universität der Bundeswehr Hamburg

Engineering Science

Bachelor of Science

Engineering Science: Defence Systems

Master of Science

Study Programme

Engineering Science (ES) is entirely taught in English and combines the fundamentals of engineering, especially in the fields of mechanical engineering and electrical engineering, with selected fundamentals in information technology. Students complete a Bachelor's degree programme followed by a Master's degree programme, which focusses on defence systems.

The Bachelor's and Master's degree programmes are intensive study programmes. Students can graduate with a Bachelor of Science degree after 2 ¼ years and with a Master of Science degree after another 1 ¾ years. The ES Bachelor programme focuses on scientific tools in fundamentals of mechanical and electrical engineering complemented by information technologies enriched by applications from military engineering. Students learn to think in interdisciplinary terms and in mechatronic systems contexts and to conceive, specify, design, test and inspect those systems as part of a frequently large and international team. Work focuses on the interaction of individual components and modules and the creation of a comprehensive system or subsystem, e.g. for military use or for improving civilian security.

The programmes prepare graduates for functional and leadership responsibilities in the armed forces and for activities in public service and (civilian) management positions. They are also a prerequisite for an academic career.

Academic training at Helmut Schmidt University (HSU) is complemented by mandatory interdisciplinary studies (ISA).

Structure

Programmes at HSU start in early October. The academic year is divided into trimesters (autumn, winter and spring). Each trimester consists of a twelve week lecture period. There are no lectures in the months of July, August and September. This time is used by students to prepare for and participate in examinations but also to complete (voluntary) internships, write research papers and theses, and to rest and relax. The ES Bachelor's degree programme, like all other Bachelor's degree programmes offered at HSU, comprises seven trimesters and consists of required modules, compulsory elective subjects, and a Bachelor's thesis. The modules are organised and synchronised in such a way that they build on previously acquired knowledge.

Students who have not completed all academic requirements of the Bachelor's degree programme after seven trimesters can be admitted to the Master's degree programme on a provisional basis. Students who have obtained their Bachelor of Science with a grade of 3.0 or better by the end of the eighth trimester can continue their studies in the Master's programme. This also applies to students who have achieved a grade of up to and including 3.4 and have passed an additional qualification interview. Students who do not meet these requirements are given time until the end of the ninth trimester to complete their Bachelor's degree. They will, however, not be admitted to a Master's programme at HSU.

Master's programmes start in early January, comprise five trimesters (eighth to twelfth trimester), and end with a Master's thesis.

Programme Contents

The Engineerin Science Bachelor's programme provides students with fundamental technical, methodological and professional skills in two fields of engineering (Mechanical Engineering and Electrical Engineering) which are required for intermediate level functional and leadership tasks and for a consecutive Master's programme. As part of their academic training, students learn the fundamental principles of research and analytical skills. In addition, the programme enables students to understand complex technical systems, especially mechatronic ones, even in an international context.

Most of the recommendations of the German associations of engineering faculties (Association of Mechanical and Process Engineering, FTMV, and Association of Electrical and Information Engineering, FTEI) are fulfilled. This broad spectrum can be reached only because there are significant overlaps within the two recommendations.

Due to a strong education in fundamentals of both, mechanical and electrical engineering, supplemented with computer science and experimental skills, the Bachelor graduates can define, design and decompose mechatronic systems as well as integrate and test them.

The Master's Programme starts with fundamental lectures and the central module "Defence Systems and Technologies" in which the students can choose from the following lectures:

- Introduction to Terminal Ballistics
- Failure Analysis and Maintenance
- Improvised Explosive Devices Disposal
- Logistics
- Electrochemical Power Sources for Mil. Appl.
- CBRN
- Naval Shipbuilding
- Systems Engineering for Land Vehicles

This central module "Defence Systems and Technologies" is prescribed for all students.
The choices of lectures within the three other modules

- HPC Systems and HPC Applications
- Computational Material Design
- Electro-Optics

give the students more free space to follow their own desires and interests. For example, they can combine HPC lectures and virtual material design lectures for the virtual design of high-performance materials for safety or energy applications or HPC and electro-optics for the virtual design of electro optical applications, e. g. for lasers.

Interdisziplinary Studies

All programmes at HSU include interdisciplinary studies courses (ISA). They enable students to broaden their horizons and to acquire general professional skills that will be of great use in their careers as officers and later as civilian employee. The ISA courses address legal issues such as (defence) procurement, transportation law, and international law in the Bachelor's programme, as well as strategic, tactical, psychological and political aspects in the Master's programme.

Language Courses

The university's language centre offers courses in English, French, Spanish, Russian, Arabic and other modern foreign languages.

In the first year of the ES Bachelor's programme students will have German language classes two hours per week. In the second year students have German classes one hour per week. Additional, they will have a class in English academic skills and academic writing.

Degrees

Students who successfully complete the Bachelor's programme are awarded the academic degree of a Bachelor of Science (B. Sc.).

Students who successfully complete the Master's programme are awarded the academic degree of a Master of Science (M. Sc.). Graduates with a Master's degree may later enrol in a doctorate programme.

Labour Market and Occupational Fields

Numerous functional and leadership positions in the armed forces, in the security and defence industry, in public administration, and in national and international rescue and relief organisations (fire services, NGOs) are open to graduates of ES. The standard degree at Helmut Schmidt University is a Master's degree. Even the Bachelor of Science, however, opens up interesting professional opportunities.

The ES programme enables students to actively shape the future and offers a wide range of professional development and career opportunities. These include the development of new logistics and mobility concepts, the study and implementation of new technologies, digital networking of all aspects of life, and the development of autonomous machines, vehicles and software agents. Technological developments and trends in the civilian sector and in the security and defence domain exert a mutual influence on one another. Engineers work in research and development, the design of military and security systems and subsystems, sales, consulting, and product management.

The number of transnational conflicts and hot spots is increasing as a result of economic globalisation and climate change. There is thus a growing demand for new national and international approaches to solutions for security in the fields of politics, economy and science. ES graduates have a firm understanding of the principles of mathematics, science, electrical engineering, information technology, and mechanical engineering which are relevant to Defence Technology. They are familiar with the fundamentals of systems technology, virtual techniques in R & D and their interactions and interdependencies and are thus able to understand the phenomena and problems that arise in Defence Systems and model them in such a way that interference is minimised. This applies both in military and civilian settings. In military applications, it primarily applies to armaments. As a rule, excellent English language skills are required on account of increasing international cooperation and procurement.

Application

Applications from international armed forces are always welcome. Due to restrictions in German higher education law Helmut Schmidt University has to assess each and every individual application for a Bachelor's or Master's programme at an early point of time. Applications for Bachelor's programme should be submitted until May 1st, for a Master's programme until September 1st.

Application forms are available online at http://www.bundeswehrkarriere.de or at your nearest careers information office. For further information, please call our hotline on +49 (0)800 9800880.

Information for prospective civilian students and companies can be found at https://zivil.hsu-hh.de

Admission Requirements

The following requirements must be met for admission to a course of study:

1. a school-leaving certificate qualifying the holder to attend a university,
2. a very good knowledge of the English language equivalent to Standard Language Profile (SLP) level 3332 (professional).

An internship or preliminary practical course is not required for the ES programme.

The ES programme was designed for Bundeswehr students and students of foreign partner nations who cooperate closely with Germany in the fields of security and defence technology (NATO and Partnership for Peace nations). It is open to military personnel as well as employees of industrial companies and international relief and rescue organisations. Civilian students are sponsored by cooperating companies that provide industry scholarships to pay tuition fees.

Preparation for Studies

The ES programme requires logical thinking and practical technical knowledge. Prospective students are encouraged to refresh their knowledge of English, mathematics and physics and to take part in the preliminary online mathematics course, which is supported by mentors. This course is offered every year starting in early May at http://vorkurs.hsu-hh.de.

Applicants for an intensive course of study at HSU must have good time-management skills and a high degree of personal commitment, as they will be expected to quickly acquire considerable knowledge.

Further Information

- On Helmut Schmidt University/University of the Federal Armed Forces Hamburg: http://www.hsu-hh.de
- On studying at the Faculty of Electrical Engineering (curriculum, course descriptions, internship and examination regulations): http://www.hsu-hh.de/et
- On studying at the Faculty of Mechanical Engineering (curriculum, course descriptions, internship and examination regulations): http://www.hsu-hh.de/mb
- On engineering: http://www.vde.com/en http://www.vdi.eu

Advisory Services/Contact Information

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The University

On the basis of the autonomy granted by the Bundeswehr and under the legal supervision of the Hamburg Ministry of Science, Research and Equality, Helmut Schmidt University/University of the Federal Armed Forces Hamburg performs the same tasks in research and education as public universities.

The four faculties of HSU offer eleven Bachelor‘s and 17 Master‘s degree programmes in a total of ten fields. All programmes have been accredited by the ACQUIN accreditation, certification and quality assurance institute. Given the favourable academic environment at HSU, all programmes are intensive study programmes in which students can acquire up to 75 credit points per year.

The campus of HSU is located in the east of Hamburg in the borough of Wandsbek. It is easy to reach both by public transport and by car. Travel time to the city centre of Hamburg is approximately 20 minutes.

All education and research facilities are situated close to one another and can be reached on foot in just a few minutes. About 80 percent of our students live in accommodation buildings located on campus or close by.

Overview Bachelor's Programme

First Year

Summer	1st Trimester (Autumn)	2nd Trimester (Winter)	3rd Trimester (Spring)
Preliminary Online Mathematics Course	Mathematics		
	Programming		
	Electrical Engineering		
	Engineering Mechanics		
	Material Science		
	Language Training (SLP 3332)		
6 CP	74 CP		

Second Year

Summer	4th Trimester (Autumn)	5th Trimester (Winter)	6th Trimester (Spring)
		Thermal/Fluids Engineering	
	Control Systems	Sensor Systems	Practical Training
	Electro Magnetics		Introduction to Electro-Optics
	Communication Systems	Drives and Propulsion	
		Compulsory Elective Course	Compulsory Elective Course
	Interdisciplinary Studies[5]		
	Language Training (SLP 3332)		
	75 CP		

Third Year

Summer	7th Trimester (Autumn)
	Student's Project & Thesis
	Compulsory Elective Course
	Academic Language and Skills
	25 CP

Autumn Trimester: 1 Oct – 31 Dec
Winter Trimester: 1 Jan – 31 Mar
Spring Trimester: 1 Apr – 30 Sep
Summer: July, August, September
CP = Credit Points

Compulsory Elective Courses

- Vehicle Dynamics
- Mechatronics/Multibody Simulation
- Design Methods
- Quality and Knowledge Management
- Heat Transfer
- Production Engineering
- Sensors and Actuators

Overview Master's Programme

Fourth Year

<table>
<tr><th>8th Trimester (Winter)</th><th>9th Trimester (Spring)</th><th>Summer</th><th>10th Trimester (Autumn)</th><th>11. Trimester (Winter)</th><th>12th Trimester (Spring)</th><th>Summer</th></tr>
<tr><td colspan="2">Mathematics (3 Lectures)</td><td rowspan="8"></td><td colspan="2">Internetworking & Cyber Security</td><td rowspan="8">MasterThesis</td><td rowspan="8"></td></tr>
<tr><td colspan="2">Defence Systems and Technologies[1]</td><td>Defence Systems and Technologies[1]</td><td></td></tr>
<tr><td></td><td>Electro-Optics[2]</td><td colspan="2">Electro-Optics[2]</td></tr>
<tr><td></td><td>HPC Systems and HPC Applications[3]</td><td colspan="2">HPC Systems and HPC Applications[3]</td></tr>
<tr><td colspan="2">Computational Material Design[4]</td><td colspan="2">Computational Material Design[4]</td></tr>
<tr><td>Interdisciplinary Studies[5]</td><td></td><td>Interdisciplinary Studies[5]</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="2">45 CP</td><td colspan="2">75 CP</td></tr>
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Defence Systems and Technologies (24 CP)[1]

- Introduction to Terminal Ballistics
- Failure Analysis and Maintenance
- Improvised Explosive Device Disposal
- Logistics
- Electrochemical Power Sources for Military Applications
- CBRN
- Naval Shipbuilding
- System Engineering for Land Vehicles
- + further modules in any trimester

Electro-Optics (min. 4 CP)[2]

- High-Power Electromagnetics
- Technical Optics
- Infrared technologies and Applications
- Laser Technology
- Laser Systems in Defence

HPC Systems and HPC Applications (min. 4 CP)[3]

- Hardware Architecture of HPC Systems
- HPC Techniques and Software Development
- Parallel Computing for Multi-Scale and Multi-Physics Problems
- Special Applications of HPC in Defence Technology
- Advanced Numerical Mathematics
- Computational Fluid Dynamics
- Computational Electromagnetics

Computational Material Design (min. 4 CP)[4]

- Continuum Mechanics
- Mateterials Modelling
- Modelling Advanced Processing Technologies
- Simulating High Strain Deformation
- Computational Design of Surfaces and Interfaces
- Statistical Thermodynamics

Interdisciplinary Studies (10 CP) [5]

- Tactics and Strategies
- Leadership an Psychology in Organizations
- Nutzungsmanagement
- History
- Political Science
- Public Law

2, 3, 4: The students chose a main module out of 2, 3, 4 (16 CP); the sum of CP in the two remaining modules out of 2, 3, 4 has to be 20 CP.
1, 2, 3, 4: Except for Naval Shipbuilding and System Engineering for Land Vehicles all courses in these four modules 1, 2, 3, 4 have 4 CP.

Editorial Information

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