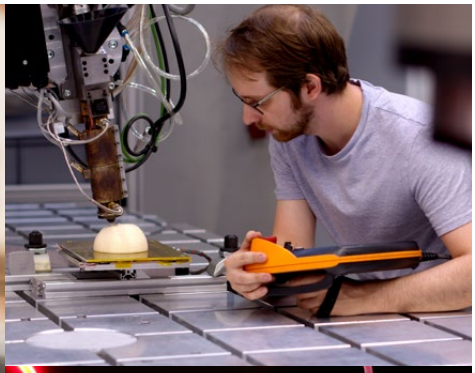
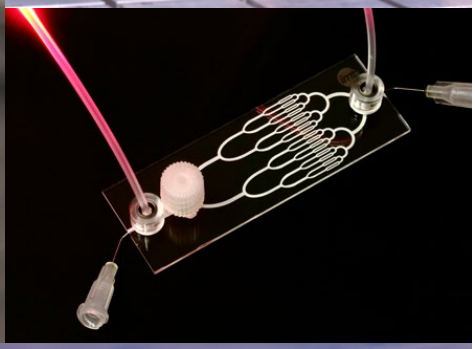
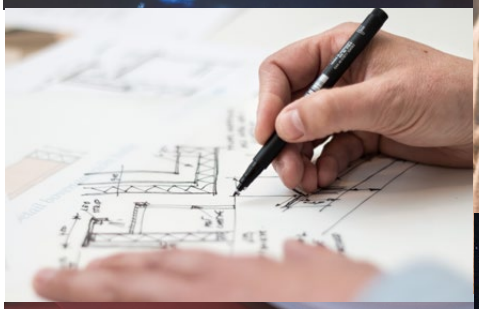
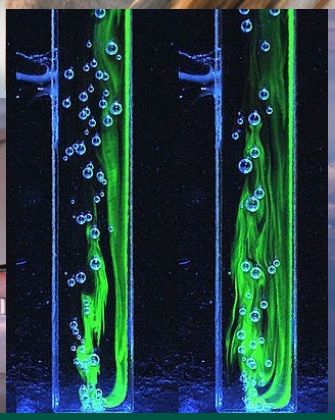
Technische Universität Braunschweig






Sustainable Engineering of Products and Processes

Bachelor of Science (B.Sc.)

At a glance

Degree	Bachelor of Science
Standard period of study	6 Semesters
Language of instruction	English, German
Start of studies	Winter semester (October, each year)
Attendance	180 CP
Admission restrictions	Pre-study internship, required language skills
Faculty	Faculty of Mechanical Engineering

Engineering the Future

Introduction_The professional work of many engineers is changing. In the past, the focus was mostly on solving detailed technical problems in research, development, and use of products. Today, comprehensive answers to global challenges, e.g. climate change and the problem of limited resources, call for new approaches. Long-term successful solution strategies need comprehensive thinking by considering the whole life cycle of products and systems, the economic balance, and societal impact.
This fundamental change must be reflected in the education of future engineers. They need technical knowledge and engineering skills as well as hands-on experience in methodologies of comprehensive assessment and evaluation. The future challenges in the fields of mobility, in products design and manufacture, in process engineering, and in energy supply require global thinking and sustainable action. Therefore, TU Braunschweig offers an international Bachelor Programme in Sustainable Engineering to open-minded, outcome-oriented students from all over the world.

Different Fields – One Goal

Overview_Since the beginning of the 21st century, tremendous changes have occurred globally, which are driven by the digitisation of economy and education, work organisation and society, as well as the increasing networking of systems. Major challenges, such as man-made climate change and the limited availability of many resources, require novel and holistic approaches. These address the environmental footprint over the entire life cycle of a product or system as well as economic considerations and the impact on society.

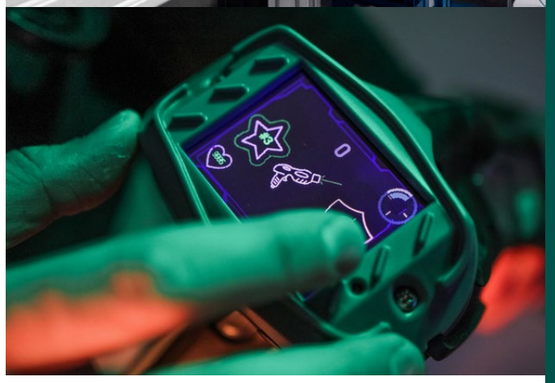
Technological change and a sustainable future are inseparably linked. The areas of individual and collective mobility, development and manufacturing of products, and efficient material conversion and energy supply require sustainable alternatives as well as methods and knowledge for their technical implementation. International thinking and acting is necessary to realize effective and sustainable technical solutions in the globalized economy.

Sustainable Energy & Process Engineering_is focused on processes of energy or material conversion that enable our everyday supply of heat and electricity as well as products such as sugar, toothpaste or medicines. Whilst engineering of these processes has been very successful to enable mass production at low cost, sustainability requires a holistic optimization, also considering aspects such as climate impact, waste and pollution, impact on society on a global scale, or dwindling resources. Novel approaches, ranging from continuous integrated production processes, biologically inspired systems to miniaturization, promise the combination of economic and ecological benefits.

Sustainable Production_Technical products are complex systems that affect the environment through the use of energy and raw materials as well as through the generation of emissions. Solutions towards achieving a sustainable development demand a life cycle-oriented approach. The aim is to minimise costs and optimise revenues as well as minimise risks and environmental impacts throughout the entire product life cycle. Digital twins - the connection of the physical world with digital models - establish a framework to evaluate both energy and material efficiency in a production process.

Sustainable Mobility_considers ground-based transport and air traffic as an overall system. Facing a global share of 24% of carbon-dioxide emissions due to transport systems based on fossil fuels, a new balance of technical, economic and ecological considerations is needed when designing the future means of transport. Disruptive technologies, such as “green” hydrogen, the electrification of drive/propulsion systems, and machine learning algorithms will contribute to shaping this paradigm shift of mobility. Beyond traffic simulation and aircraft/vehicle design, intermodal interaction of the transport systems must be incorporated into a sustainable mobility concept.

Perspectives_Sustainable engineering will make a great impact on the future of our planet that goes beyond building better technologies. Appreciation for natural systems and resources, economic development opportunities, and the promise of a life in dignity for all humans are at stake. Sustainability can only succeed as a joint effort. Cross-disciplinary knowledge sharing, social and environmental responsibility, and an ethical framework are core values of the new generation of future-oriented engineers.



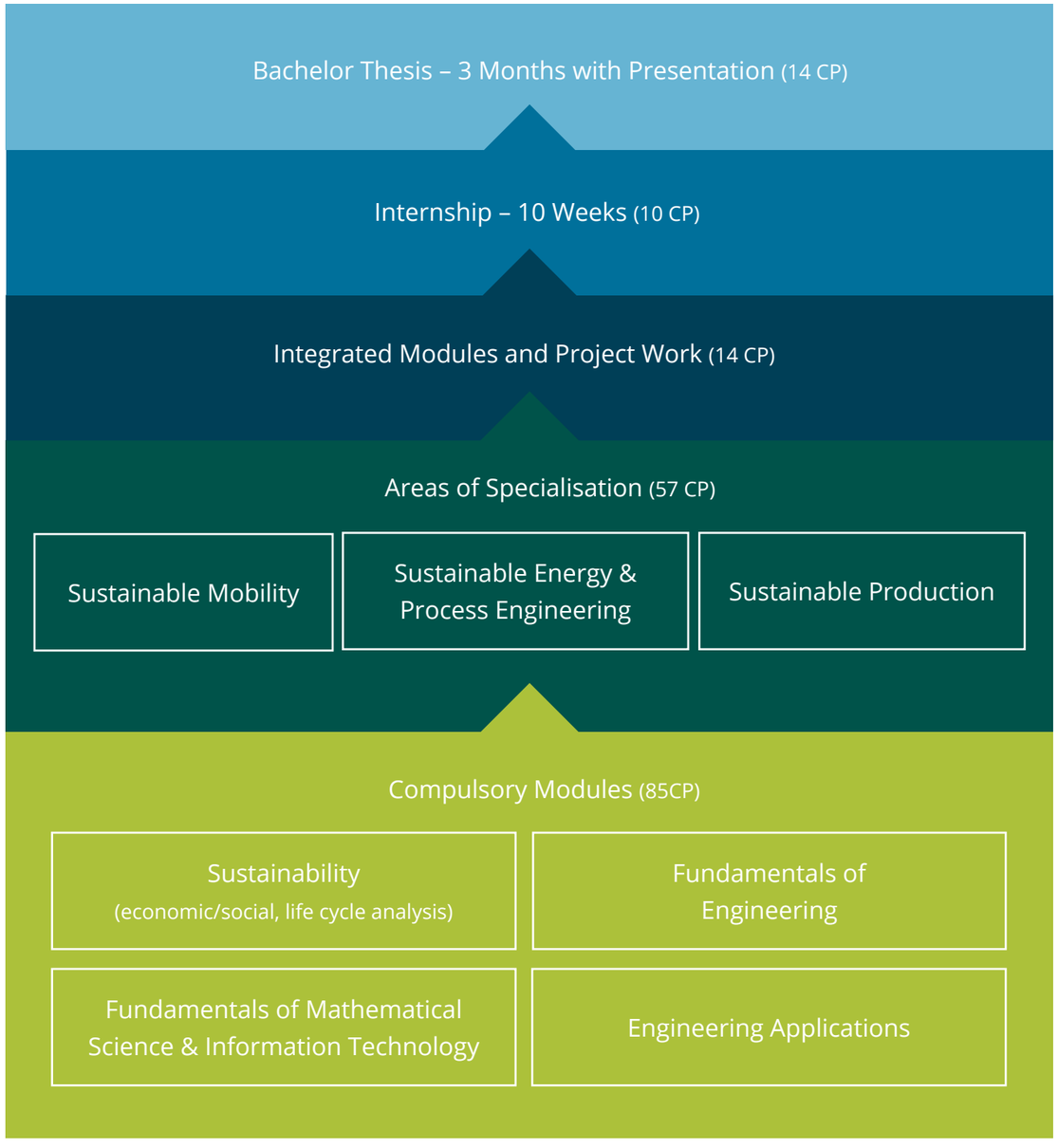
Let Us Act Together Now

Motivation&Mission_The world needs people with the courage and skills to tackle the challenges of sustainability around us and find solutions. Be one of us! More and more corporations and research institutes search for engineers who know about novel and effective ways of solving challenging problems and act environmentally responsible. We will provide you with a quality education in engineering. You will open the door to performing high quality research, and to participating in scientific breakthroughs in sustainability.

1989 First automated landing with GPS
2010 First autonomous urban driving
2015 Battery LabFactory Braunschweig
2019 Cluster of Excellence in Sustainable Aviation (SE^{2}A)

Same Fundamentals
Different Specialisation

Structure_The contents of the study programme are divided into five parts: Compulsory modules, modules in your area of specialisation, integrated modules and project work, an internship at a company of your choice and last but not least the Bachelor thesis that you select to prove your ability to perform scientific work. The lectures are made available in English in the first four semesters.



Muster Curriculum_Below is an exemplary curriculum, which is suited for students of the specialisation area Sustainable Mobility*. During the first two semesters you will learn about the fundamentals of engineering, mathematical science and sustainability. You can then compose your course programme of the last semesters according to your interests.

1	2	3	4	5	6
Engineering Mathematics		Thermo-dynamics	Engineering Design	Aerodynamics	Lab Module: Aeronautical Engineering
Engineering Mechanics		Fluid Mechanics	Control Theory	Aircraft Performance	Aircraft Design
Sustainable Business Economics		Digital Tools		Air Traffic Simulation	Internship
Material Science	Environmental and Social Sustainability	Energy Systems	Multimodal Transport Systems	Aircraft Propulsion	Bachelor Thesis
	Fascination Mechanical Engineering	Sustainable Product Development & Engineering Design	Drive Systems	Vehicle Design	
Language Courses / Integrated Modules		Project Work	Intelligent and Connected Vehicles	Lightweight Design	

Thinking out of the box
Across all semesters, certain credit points are reserved for courses beyond the technical field of sustainable engineering. Our non-technical lecture pool contains language courses, courses from psychology or medicine – it is up to you!

** You can find exemplary curricula for the other specialisation areas on our homepage (see chapter Course Structure)*

Become One of Us

Admission & Application_We want you! Nonetheless, there are some requirements in order to be accepted as a student of Sustainable Engineering. In particular, the international orientation of Sustainable Engineering requests evidence about your language skills in German and English.*

- **Required language skills in German:**
  German Abitur / completed 2-years of school education in German, German as school subject in the last 8 years or successful completion of the DSH 1, Test-DaF 4x3 or a comparable test

- **Required language skills in English:**
  University entrance qualification in an English-speaking country, completed 2-years of school education in English language, English as school subject in the last 8 years or successful completion of an internationally-recognized test

- If your German language skills do not meet these requirements, you may still be admitted if you can prove at least basic knowledge (A1 level). In this case, you can take German classes as part of your studies, and need to fulfill the language requirements until the end of the 3rd semester.

- Pre-study internship: The study programme requires an 8-weeks pre-study internship, during which you obtain basic mechanics skills, to be completed until the end of the 4th semester.

SERVICEteam – Faculty of Mechanical Engineering

Student Counseling | Exams | Internship

+49 (0) 531 391 4040
service-fmb@tu-braunschweig.de
Faculty of Mechanical Engineering
www.tu-braunschweig.de/fmb

Reducing the Language Barriers

Internationality_Studying in a foreign country can be a challenging experience. To help you adapt to your new life in Braunschweig, we offer a range of services for international students. With the bilingual course concept, language classes, tutoring programmes and intercultural study groups you will be able to make the most of your time at TU Braunschweig and beyond. Internationally renowned faculty members will also help you to achieve your professional goals: After completion of the Bachelor course, you will be able to analyse subject-specific and interdisciplinary problems, to develop sustainable solutions and to represent them convincingly in a professional and interdisciplinary manner, in both German and English language.

** Details of the required skills are provided in the admission regulation document which will be made available to applicants before the final application period begins.*

- The entire Bachelor course including its course material is based on a bilingual concept.
- Language courses can be integrated in the study course, where you can further improve your skills in German and English language.
- International and native students will work together in groups to mutually improve intercultural competences and networks.
- After successful completion of the course, you will have outstanding opportunities on the German and international job market.

"The Language Centre of TU Braunschweig has very qualified teachers. I joined the intensive German language course. After one year, I was able to read scientific textbooks and lecture notes in German."

Uche Agbogwu from Nigeria.

Mobility Research @ TU Braunschweig

How to sustainably transport people and goods on roads and rail in the future? These questions are answered by scientists of the Automotive Research Centre Niedersachsen (NFF). The NFF is one of the largest public centres for mobility research in Germany with a great research infrastructure. Its research covers autonomous driving, electric mobility, efficient vehicle concepts of the future, vehicle production, and smart logistics.

Interview with Prof. Dr.-Ing. Thomas Vietor

Chairman of the Automotive Research Centre Niedersachsen (NFF)

Insights_Professor Vietor provides insight into the role of sustainability at the NFF and the opportunities of future students to be part of the ongoing transformation in the mobility sector.

Which is the most urgent topic in the mobility sector of ground traffic?
The most important recent and future topics in mobility are sustainability and safety. Sustainable mobility means that all moving and transporting of people, animals and goods is done under specific consideration of the limitation of all used resources. For sustainable mobility not only the transport itself is considered but as well the production and energy consumption for the raw materials needed for the vehicle and for recycling or re-use after the usage period. Safety on the other hand means to prevent accidents or limit the negative impact of accidents.

What is special about the study programme Sustainable Engineering?
The main focus of the courses I am currently teaching is on mechanical engineering. However, during my industry experience and in our research projects I experienced the importance of interdisciplinary work specifically in the large field of mobility. In the study programme Sustainable Engineering, students will learn methods from different disciplines and how to work in interdisciplinary teams. This is very special for a study programme and an excellent basis for working in science and industry.

How will students of Sustainable Engineering be involved in the research work at the NFF?
The research institutes of the NFF teach part of the course programme and bring in their experience in research and application. Students can select research projects offered by the 44 institutes of the NFF. Accordingly, they use their state-of the-art infrastructure like the virtual-reality lab or the experimental vehicles for autonomous driving. The research projects cover various disciplines, e.g. vehicle engineering, engineering design, traffic planning or psychology.

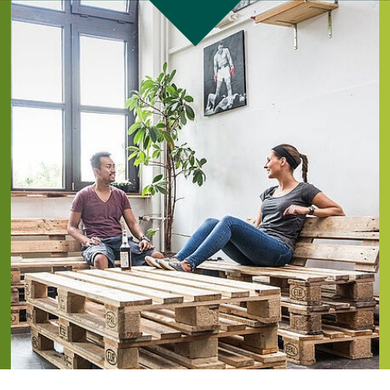
A Special Place to Study

Braunschweig_More than 16,000 people work in research institutions in the Braunschweig region and an additional 20,000 in industrial research and development - this represents about 4% of the total employment in the region and therefore the highest density of scientists in Europe. Thanks to the large number of students, Braunschweig is a very lively and colourful city: You will find all sorts of clubs, ranging from mainstream to alternative to electro, from pubs to jazz clubs. If you are looking for something different on the weekend: The German capital Berlin is only a 90-minute train ride away. For those who prefer to be outdoors rather than going to the movies, Braunschweig won't disappoint either. The city is known for its many parks and recreational spaces and is home to a number of top sports clubs. The many sports clubs and gyms in Braunschweig also offer various possibilities for sporting activities. Whether Aikido or American Football, gliding or sailing, rowing or tennis: there is something for everyone.

1745 Foundation of TU Braunschweig
19.694 Students
118 Home countries of international students
3.789 University employees

Intercultural Partner Project

Discover the old town of Braunschweig together



Studying at a liberal-minded university

Where You Can Meet Us

Welcome to the Faculty of Mechanical Engineering With about 5.000 students, the Faculty of Mechanical Engineering is the largest faculty at TU Braunschweig. Our 25 institutes research and teach in the fields of Sustainability, Automotive Engineering, Aerospace Engineering, Energy and Process Engineering as well as Production and Systems Engineering. Numerous international cooperations enrich study and research for our students, scientists and our international guests.

4659 Engineering students
22% International students
610 Researchers
25 Institutes

International House (IH)
international@tu-braunschweig.de
www.tu-braunschweig.de/international/

Program inTU
www.intu.tu-bs.de

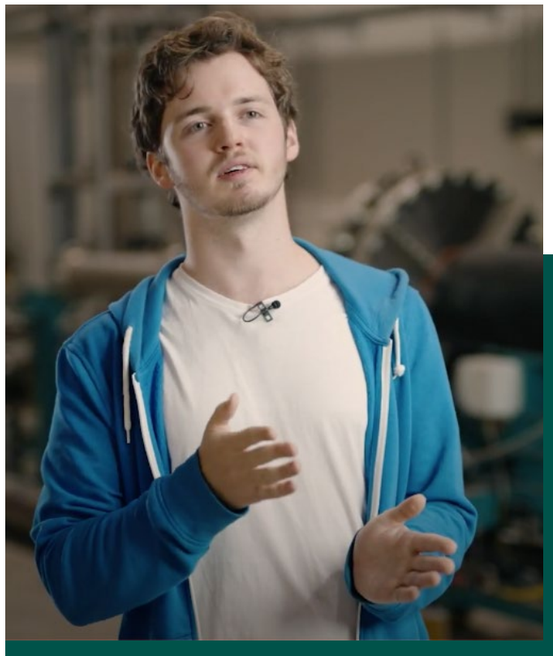
SCOUT: Support and networking for international students
www.tu-braunschweig.de/scout

S.O.S. – Studying without language barriers
www.tu-braunschweig.de/sprachenzentrum/projekte/sos-projekt

Gauss Friends e.V.
www.gauss-freunde.de

International Student Network
www.braunschweig.esn-germany.de

Head Office of the Faculty of Mechanical Engineering
Schleinitzstraße 20
D-38106 Braunschweig
+ 49 (0)531-391-4040
service-fmb@tu-braunschweig.de



"TU Braunschweig offers a plethora of student associations and there are many possibilities for teaching and research assistant jobs, where you can apply the knowledge that you gain in the courses."

Alexander Vorgias from Greece

Fakultät für Maschinenbau | Schleinitzstraße 20
38106 Braunschweig | Germany
service-fmb@tu-braunschweig.de
www.tu-braunschweig.de/fmb

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Version 1.3 – 26.03.2021