

Bachelor of Engineering (B. Eng.) “Sustainable Resources, Engineering and Management (StREaM)”

Module overview (Status: July 2021)

	A	B	C	D	E - Project	F - Languages & Portfolio		
1	Sustainable Development (Interdisciplinary Introduction) (5 CP)	Fundamentals of Natural Science (5 CP)	Mathematics 1 (5 CP)	Fundamentals of Economic Science (5 CP)	Intercultural Communication and Participation (5 CP)	German / Other Foreign Language (A1) (5 CP)	Portfolio (Reflection and Personal Development) incl. Career Pathways (5 CP) (online during sem. 6)	
2	Materials and Production Engineering (5 CP)	Ecology, Resources and Sustainable Cities (5 CP)	Mathematics 2 (5 CP)	Engineering Mechanics and Fluid Mechanics (5 CP)	Scientific Project and Academic Skills (5 CP)	German / Other Foreign Language (A2) (5 CP)		
3	Renewable Energy Systems (5 CP)	International Law and Policies (5 CP)	Information Technology and Data Science (5 CP)	Machine Design (5 CP)	Production Management and Global Supply Chains (5 CP)	German / Other Foreign Language (B1) (5 CP)		
4	Sustainability Management (5 CP)	Ethics and Social Responsibility (5 CP)	Business Development, Innovation Management and Marketing (5 CP)	International Accounting and Finance (5 CP)	Product Development and Production Processes (5 CP)	German / Other Foreign Language (B2) (5 CP)		
5	Elective Module (5 CP)	Elective Module (5 CP)	Team Development and Leadership (5 CP)	Controlling and Project Management (5 CP)	Interdisciplinary Project (5 CP)	German / Other Foreign Language (C1) (5 CP)		
6	Elective Module (online) (5 CP)	Academic Skills Refresher and Internship Mentoring (online) (5 CP)	Internship (Option: Studying Abroad) (15 CP)					
7	Internship (Bachelor Project) (18 CP)			Bachelor Thesis and Defense (12 CP)				

Profile and learning outcomes of the programme of study

StREaM (B. Eng.) is an interdisciplinary, international Bachelor's programme that combines engineering and economics, with a special focus on sustainability as an overlapping theme. On the one hand, students acquire basic knowledge in both engineering and economics. On the other hand, they know and understand the principles of sustainable development as well as its importance for the economy and industry, for the environment and to society in Germany and internationally.

Upon completion of the programme, students have acquired skills that allow them to:

- identify and analyse problems that intersect engineering and economics and to work with others to develop solutions to these problems,
- plan, carry out and evaluate sustainability projects, while taking into account engineering, economic, ecological, societal and cultural perspectives,
- communicate, collaborate and cooperate successfully within interdisciplinary and intercultural contexts, also while using digital tools,
- reflect upon their competence and their personal development as well as to continuously develop themselves.

Career perspectives

Job opportunities exist, e. g., in industrial and service companies as well as in the public sector – and generally in any sector where skills are needed to make production and product development processes more sustainable and to manage resources and energies in a responsible way.

Their interdisciplinary academic education allows StREaM (B. Eng.) graduates to work in positions that require an understanding of both technology and economics, e. g., in the fields of product distribution, product development as well as in quality and environmental management. Another field of activity is management consulting. Possible occupational profiles are project manager, product owner, compliance manager and management consultant.

The international Bachelor's programme StREaM (B. Eng.) opens up various job opportunities in Germany and internationally.

Module information (short version) – Semester 1

Module title	Module information (short version)
Sustainable Development (Interdisciplinary Introduction) Nachhaltige Entwicklung (Interdisziplinäre Einführung)	This module introduces students to the topic area of sustainable development and to the UN's Sustainable Development Goals (SDG) 2030, including sub-topics and questions related to the economy and industry, to ecology and to society. The lecture also provides an introduction to topics of selected modules from later semesters. This way, students get a preview of what to expect during their studies and get to know lecturers and their areas of specialisation.
Fundamentals of Natural Science Naturwissenschaftliche Grundlagen	Selected fundamentals of physics, chemistry and biology that are relevant with regard to the profile and to the objectives of the programme of study (see above).
Mathematics 1 Mathematik 1	1. Fundamentals of elementary functions, 2. Differential and integral calculus with one independent variable, 3. Functions, differential calculus with several independent variables, 4. Linear algebra, especially systems of equations and calculus of matrices, 5. Financial mathematics, economic models. With practical applications throughout the entire module.
Fundamentals of Economic Science Wirtschaftswissenschaftliche Grundlagen	This module familiarises students with the fundamentals of business administration and national economy. Contents include basic terms and concepts of economics, the diversity of the economy and its characteristic forms, an overview of the functional theory of business administration and an introduction to microeconomics and macroeconomics. The module includes relevant disciplinary extensions with reference to sustainability.
Intercultural Communication and Participation (PROJECT) Interkulturelle Kommunikation und Teilhabe	This module is designed to foster social and academic integration into the programme of study and, in a broader sense, life on campus. Contents are concepts of culture and their relevance in the academic and professional context, intercultural communication, intercultural group and team work, group dynamic processes and team roles. This knowledge will be applied, made tangible and reflected upon via case studies as well as workshop and group work sessions. Planned conclusion: project week.
German as a Foreign Language / Other Foreign Language (A1) Deutsch als Fremdsprache / Andere Fremdsprache (A1)	During this module, international students develop their German language skills. German students / students with existing knowledge of the German language take another foreign language. This module is compulsory from semesters 1 to 5. Semesters 1 to 4 (GER levels A1 to B2): exam; semester 5: attendance certificate. This module can be chosen as an Elective Module in semester 6.
Portfolio (Reflection and Personal Development) Portfolio (Reflexion und persönliche Entwicklung)	This module runs from semesters 1 to 6 and is completed at the end of semester 6. In groups as well as individually, students reflect upon their competence development and upon their personal development (e. g. strengths and weaknesses, coping with study requirements), create their professional profile and prepare for their entry into professional life (Career Pathways). During this process, they are advised and accompanied by teaching staff.

Module information (short version) – Semester 2

Module title	Module information (short version)
Materials and Production Engineering Werkstoffkunde und Fertigungstechnik	Materials: Structure and basic properties of engineering materials, phase diagrams, in particular the iron-carbon diagram, thermal treatment methods, hardening, failure and fracture, plasticity, wear. Production engineering: Overview on production measurement technology and workpiece quality, fundamentals of main manufacturing processes (primary shaping, forming, cutting, joining, coating). The module also includes chemical engineering processes used for material conversion.
Ecology, Resources and Sustainable Cities Ökologie, Ressourcen und nachhaltige Städte	Ecology: Fundamentals of ecology and ecosystems. Resources: Utilisation of natural resources and assessment over the entire cycle of utilisation according to an integrated circular economy. Sustainable Cities: Sustainable infrastructure planning of urban settlement areas with a focus on water supply and wastewater disposal, rainwater usage and management, energy supply, urban planning approaches and transport planning.
Mathematics 2 Mathematik 2	1. Calculation with complex numbers, 2. Ordinary differential equations, 3. Statistics, probability, simulations, 4. Laboratory: Tools for computational mathematics (MATLAB, EXCEL, SCIP). With practical applications throughout the entire module.
Engineering Mechanics and Fluid Mechanics Technische Mechanik und Hydromechanik	Engineering Mechanics: Statics (fundamental principles of the mechanics of rigid bodies and the application of these principles to engineering problems) and strength of materials. Fluid Mechanics: Physical properties of water, hydrostatics and buoyancy, fundamentals of hydrodynamics, pipe flow, open channel flow. In addition to the theoretical principles, students are also familiarised with methods and approaches for solving engineering problems and learn how to apply them autonomously.
Scientific Project and Academic Skills (PROJECT) Wissenschaftliches Projekt und Academic Skills	In this project module, StREaM students work in teams with students from other Bachelor's programmes of the Department of Engineering and Industrial Design on a given project topic (drilling machine). At the same time, they are introduced to working, writing and presenting according to the scientific standards in their professional field. This module also exists in the curricula of other degree programmes of the stated department.
German as a Foreign Language / Foreign Language (A2) Deutsch als Fremdsprache / Andere Fremdsprache (A2)	This module is compulsory from semesters 1 to 5 and can be chosen as an Elective Module in semester 6 – see module information semester 1.
Portfolio (Reflection and Personal Development) Portfolio (Reflexion und persönliche Entwicklung)	This module runs from semesters 1 to 6 and is completed at the end of semester 6 – see module information semester 1.

Module information (short version) – Semester 3

Module title	Module information (short version)
Renewable Energy Systems Erneuerbare Energiesysteme	1. Renewable power grid components and functions, 2. Operation of electric power grids, 3. Challenges and solutions for the transition to carbon-free production, 4. Carbon-free mobility systems for land-based vehicles (on road, off road, on track), 5. Visions for sustainable mobility in the future, 6. Anaerobic treatment of organic waste, 7. Electricity and heat generation by municipal waste incineration, 8. Use of environmental heat.
International Law and Policies Recht und Politik international	This module focuses on selected areas of international/European Union (EU) and German federal public and private law (including commercial law) that are important for working in a globally operating company. It also includes topics such as the United Nations (UN) sales law, economy and policies of the EU, the EU Corporate Social Responsibility (CSR) Directive and the German CSR-reporting law, product liability and environmental law.
Information Technology and Data Science Informatik und Data Science	In this module, theories and concepts related to the realisation of information systems are taught and applied using databases as an example. The module includes the fundamentals of Structured Query Language (SQL) and database design (as well as data analysis using spreadsheets) in connection with business-relevant issues. It also provides a short introduction to Big Data Analytics and Data Science.
Machine Design Konstruktionslehre	Theoretical part: Machine elements, methodical design and computer-aided design (CAD). Practical part: Application of the conveyed knowledge within the framework of a technical design project including calculation and drawing.
Production Management und Global Supply Chains (PROJECT) Produktionswirtschaft und globale Lieferketten	By means of a business game oriented towards sustainable production management, this project module conveys the fundamentals of production, logistics and supply chain management. Details: Based on case studies, students deal with sustainability issues such as the CO ₂ -footprint and issues related to sustainability in production planning and supply chain management. Students will deepen their understanding of these issues by participating in a business game based on a fictitious company.
German as a Foreign Language / Foreign Language (B1) Deutsch als Fremdsprache / Andere Fremdsprache (B1)	This module is compulsory from semesters 1 to 5 and can be chosen as an Elective Module in semester 6 – see module information semester 1.
Portfolio (Reflection and Personal Development) Portfolio (Reflexion und persönliche Entwicklung)	This module runs from semesters 1 to 6 and is completed at the end of semester 6 – see module information semester 1.

Module information (short version) – Semester 4

Module title	Module information (short version)
Sustainability Management Nachhaltigkeitsmanagement	In addition to an introduction to international guidelines for organisations on how to assess and address social responsibilities (ISO 26000), this module covers certifiable subsystems of sustainability management such as safety and health management (ISO 45001), environmental management (ISO 14001), quality management (ISO 9001) and energy management (ISO 50001). Students are also familiarised with CSR-reporting and with environmental assessment systems as well as with how they both relate to one another.
Ethics and Social Responsibility Ethik und soziale Verantwortung	The focus of this module is on basic concepts and problems of economic and corporate ethics as well as on ethical principles in engineering and the social responsibility of engineers. Subtopics are for example: ethics and values; conflicting goals; compliance; management in the area of conflict between justice, power and freedom; reputation, trust, corruption; error culture and management; Corporate Social Responsibility (CSR). Students gain a deeper understanding of relevant concepts and problems by using up-to-date case studies and research.
Business Development, Innovation Management and Marketing Geschäftsentwicklung, Innovationsmanagement und Marketing	Business Development: Students learn how to generate and assess sustainable, innovative business ideas, e. g., with regard to commercial viability and feasibility. In the course of projects they learn how to develop business models and make first steps towards implementation. Innovation Management and Marketing: The objective is to show how to increase the probability of a successful product launch and market diffusion. Students are familiarised with and apply concepts, methods and tools that are important during innovation processes and for the marketing of innovations.
International Accounting and Finance Internationale Rechnungslegung und Finanzwirtschaft	Financial principles (including the results of financial accounting); financial planning, management and control; external financing; internal financing; special forms of financing. Contents: The definition of investment; investment planning; static methods of investment; start-up financing; capital increase; restructuring, transforming and merging companies; insolvency proceedings; internal factors (operational environment) and their impact on financing; policies of banks and financial institutions; financial innovation; capital requirements directives.
Product Development and Production Processes (PROJECT) Produktentwicklung und Produktionsprozesse	This module focuses on products as economic goods. In the context of sustainability (ecological, social and economic perspectives), students learn how to assess products along their life cycles with regard to design, optimisation, material usage, production, use and disposal. For this, a specific product is assessed (economic, technical and ecological assessment) by means of specific tools. Building on this, students develop suggestions for improving the product.
German as a Foreign Language / Other Foreign Language (B2) Deutsch als Fremdsprache / Andere Fremdsprache (B2)	This module is compulsory from semesters 1 to 5 and can be chosen as an Elective Module in semester 6 – see module information semester 1.
Portfolio (Reflection and Personal Development) Portfolio (Reflexion und persönliche Entwicklung)	This module runs from semesters 1 to 6 and is completed at the end of semester 6 – see module information semester 1. During semesters 4 and 5 students prepare for their internship in semester 6 (see module information semester 6).

StREaM (B. Eng.) – Programme information (Status: July 2021) / Please note: The module descriptions are currently being finalised. The information presented is still subject to (minor) changes. The scheduled start date is 1 April, 2022.

Module information (short version) – Semester 5

Module title	Module information (short version)
Elective Module Wahlpflichtmodul	The curriculum comprises three compulsory Elective Modules which can be selected from a list of given modules. Planned modules are for example: Renewable Energies; Sustainable Mobility; Finite Elements and Structural Optimisation; Fatigue and Fracture Mechanics; Climate Change and Adaptation Management; Industrial Ecology; Water Resources and Water Use; Sustainable Buildings; Digital Business and E-Commerce; Enterprise Resource Planning (ERP) Systems; Human Resource Management. One of these three Elective Modules can be selected from any other study programme (this choice is subject to agreement of all parties).
Elective Module Wahlpflichtmodul	See row above.
Team Development and Leadership Teamentwicklung und Leadership	Contents include sustainable team leadership / team development and employee management, leadership styles, participation, management of intercultural teams and virtual leadership. Students also reflect upon their own burdens and limits as well as on occurring conflicts in their teams, upon self-imposed and external learning outcomes and work objectives as well as upon consequences for the work processes within their teams.
Controlling and Project Management Controlling und Projektmanagement	Controlling: This part of the module introduces students to strategic, operational and sustainable controlling as well as to corresponding tools and methods used to implement sustainability strategies and to measure, document and communicate their results (e. g. in the context of sustainability reporting). In addition, students are familiarised with the fundamentals of project management (PM) which they learn to apply through use cases as well as through (digital) PM tools/methods (e. g. Scrum, Kanban, Gantt) and in connection with operative (project) controlling.
Interdisciplinary Project (PROJECT) Interdisziplinäres Projekt	Students apply and transfer the competencies they have acquired to the realisation of a specific project. They do this by working in interdisciplinary and intercultural teams, using digital tools. The emphasis of this module is less on acquiring technical knowledge. Instead, it is on collaboratively creating a complex product, learning together and from each other as well as reflecting upon these learning and working processes. Please note: This module is compulsory for all Bachelor students at the Department of Engineering and Industrial Design. Ideally, StREaM students work in groups with students from other Bachelor's programmes.
German as a Foreign Language / Foreign Language (C1) Deutsch als Fremdsprache / Andere Fremdsprache (C1)	This module is compulsory from semesters 1 to 5 and can be chosen as an Elective Module in semester 6 – see module information semester 1.
Portfolio (Reflection and Personal Development) Portfolio (Reflexion und persönliche Entwicklung)	This module runs from semesters 1 to 6 and is completed at the end of semester 6 – see module information semester 1. During semesters 4 and 5 students prepare for their internship in semester 6 (see module information semester 6). During semesters 5 and 6 students prepare for their Bachelor Project in semester 7 (see module information semester 7).

Module information (short version) – Semester 6

Module title	Module information (short version)
Elective Module (online) Wahlpflichtmodul (online)	For planned Elective Module contents see semester 5. Since semester 6 includes an internship/mobility period, the Elective Module in semester 6 is planned as an online module.
Academic Skills Refresher and Internship Mentoring (online) Academic Skills Refresher und Mentoring Praxisphase	Academic Skills Refresher: This part of the module helps students to refresh their academic skills (scientific working and writing skills) and to get prepared for their internship in semester 7 (Bachelor Project) as well as for writing their Bachelor Thesis. Internship Mentoring: The objective of this part of the module is to support and accompany students during their internship or study abroad period. The module is planned as an online module.
Internship Praxisphase	Students complete an internship in Germany or abroad. Optionally, they can also study abroad. Students write an internship report. In order to ensure as much flexibility as possible, the three other modules that have to be completed during semester 6 are planned as online modules.
Portfolio (Reflection and Personal Development) (online) Portfolio (Reflexion und persönliche Entwicklung)	This module runs from semesters 1 to 6 and is completed at the end of semester 6 – see module information semester 1. During semesters 5 and 6 students prepare for their Bachelor Project in semester 7 (see module information semester 7).

Module information (short version) – Semester 7

Module title	Module information (short version)
Internship (Bachelor Project) Praxisphase (Bachelor-Projekt)	The objective of this second internship is to carry out a Bachelor Project. The practical tasks and problems worked on and the experience gained are presented and reflected upon in an internship report. An interlocking of this internship and the Bachelor Thesis is recommended.
Bachelor Thesis and Defense Bachelor-Arbeit mit Kolloquium	Autonomous scientific analysis of and research on a practical problem within a given time limit.