



## **Module Manual**

### **General Engineering (B.Sc.)**

**Entry Phase**

**Semesters 1-2**

## Content Management

Version	Date	Revised by	Änderung
1.0	05.09.2024	Bauer	Creation of the module handbook
1.1	08.01.2025	Rübner	Adaptation of the module titles "Deutsch A1" (i.e. "German A1", 14987) and "Deutsch A2" (i.e. "German A2", 15192) to the examination regulations; update of the category 'lecturer' in the module description of "Präsentieren in Englisch" (i.e. "Presenting in English" (15040))

## Contents

<b>SEMESTERS 1-2: Entry Phase – STEM Basics</b> .....	<b>3</b>
Mathematics 1 (15212) .....	3
Programming 1 (15246).....	5
General Chemistry (15262) .....	7
Introduction to Physics (14984) .....	9
Electrical Engineering 1 (15123).....	11
Mathematics 2 (15232) .....	13
Basics of Digitalization (15195) .....	15
Materials Science (15226) .....	17
Technical Mechanics 1 – Statics (15198).....	20
General Engineering (PRACTICE) (15029).....	22
<b>SEMESTERS 1-2: Entry Phase – Languages</b> .....	<b>25</b>
German A1 (14987) .....	25
Business/Technical English (15122) .....	27
German A2 (15192) .....	29
Presenting in English (15040).....	31

## SEMESTERS 1-2: Entry Phase – STEM Basics

### Mathematics 1 (15212)

<b>Module Title</b>	<b>Mathematics 1</b> <i>[Mathematik 1]</i>			
<b>Module Number</b>	<b>15212</b>			
<b>Module Responsibility</b>	Prof. Dr. rer. nat. Jens Wallys			
<b>Lecturer</b>	Prof. Dr. rer. nat. Jens Wallys			
<b>Degree Program</b>	General Engineering (B.Sc.)			
<b>Status</b>	Compulsory module	X	Compulsory elective module	
<b>Semester</b>	1			
<b>Forms of Teaching</b>	Lecture and exercise			
<b>Language of Teaching</b>	English			
<b>Hours per Week (SWS)</b>	Lecture	2	Exercise	2
<b>Workload (h)</b>	Lecture	30	Exercise	30
	Seminar		Workshop	
	Excursion		Work Placement	
	Self-Study	90	Examination Preparation	
<b>Workload total (h)</b>	150 h			
<b>Credits</b>	5			
<b>Prerequisites</b>	Basic knowledge according to the admission requirements for the degree programs.			
<b>Focus on the Sustainability Goals (17 UN SGDs)</b>	<ul style="list-style-type: none"> <li>▪ SGD 4 – Quality Education</li> <li>▪ SGD 7 – Affordable and Clean Energy</li> <li>▪ SGD 9 – Industry, Innovation, and Infrastructure</li> <li>▪ SGD 12 – Responsible Consumption and Production</li> </ul>			
<b>Goal of study and competences</b>	The students know and understand a selection of specific mathematical terms, proven correlations and applicable procedures (see contents). With the help of these methods, they can select and apply suitable methods for solving			

	mathematical problems that are typical of the engineering sector and use it to calculate a solution.
<b>Contents of study</b>	<ul style="list-style-type: none"> <li>▪ Mathematical foundations:             <ul style="list-style-type: none"> <li>▪ Set theory / set of Numbers</li> <li>▪ Propositional logic</li> </ul> </li> <li>▪ Mappings</li> <li>▪ Sequences</li> <li>▪ Elementary / polynomial functions</li> <li>▪ Solving equations / inequalities</li> <li>▪ Solving systems of linear equations</li> <li>▪ Introduction to vector calculus</li> <li>▪ Matrix calculus             <ul style="list-style-type: none"> <li>▪ Coefficient matrices of systems of linear equations</li> <li>▪ Determinants</li> <li>▪ Laplace expansion</li> <li>▪ Inverse</li> <li>▪ Eigenvalues / Eigenvectors</li> </ul> </li> </ul> <p><b>Exercises:</b> Aim at a deeper understanding of the lecture contents. Some of the weekly assigned exercises are revised.</p>
<b>Form of exam</b>	Written examination, duration 90-120 minutes, graded. The grade corresponds to the grade for the module.
<b>Literature</b>	<ul style="list-style-type: none"> <li>▪ <i>John Shannon; Mathematics for Business, Economics &amp; Finance , Wiley, 1995.</i></li> <li>▪ <i>Kwong-Tin Tang: Mathematical Methods for Engineers and Scientists 1, Springer, 2007.</i></li> <li>▪ <i>Jagdish C. Arya, Robin W. Lardner: Mathematical Analysis, Englewoods Clifs, 1993.</i></li> <li>▪ <i>K. A. Stroud: Engineering Mathematics, Bloomsbury Academic, 2020</i></li> </ul>

**Programming 1 (15246)**

<b>Module Title</b>	<b>Programming 1</b> <i>[Programmieren 1]</i>			
<b>Module Number</b>	<b>15246</b>			
<b>Module Responsibility</b>	Prof. Dr.-Ing. Rainer Rasche			
<b>Lecturer</b>	Prof. Dr.-Ing. Rainer Rasche / Dr. rer. nat. Nils Beckmann			
<b>Degree Program</b>	General Engineering (B.Sc.)			
<b>Status</b>	Compulsory module	X	Compulsory elective module	
<b>Semester</b>	1			
<b>Forms of Teaching</b>	Lecture and exercise			
<b>Language of Teaching</b>	English			
<b>Hours per Week (SWS)</b>	Lecture	2	Exercise	2
<b>Workload (h)</b>	Lecture	30	Exercise	30
	Seminar		Workshop	
	Excursion		Work Placement	
	Self-Study	90	Examination Preparation	
<b>Workload total (h)</b>	150 h			
<b>Credits</b>	5			
<b>Prerequisites</b>	Basic knowledge according to the admission requirements for the degree programs.			
<b>Focus on the Sustainability Goals (17 UN SGDs)</b>	<ul style="list-style-type: none"> <li>▪ SGD 4 – Quality Education</li> <li>▪ SGD 7 – Affordable and Clean Energy</li> <li>▪ SGD 9 – Industry, Innovation, and Infrastructure</li> <li>▪ SGD 12 – Responsible Consumption and Production</li> </ul>			
<b>Goal of study and competences</b>	<ul style="list-style-type: none"> <li>▪ The students understand the fundamental concepts of programming.</li> <li>▪ They know different data types and data structures.</li> <li>▪ They know useful mathematical functions that are already built into Python and can also create their own functions.</li> <li>▪ The students are able to write simple modular programs independently.</li> <li>▪ They are also able to verify the programs independently.</li> </ul>			

<p><b>Contents of study</b></p>	<p>As part of this module, basic knowledge on the subject of software development is taught in the Python language. In particular, the following subject areas are being worked on:</p> <ul style="list-style-type: none"> <li>▪ Introduction to the topic of programming</li> <li>▪ Introduction to the Python language</li> <li>▪ Creation of the programming environment (interpreter, IDE) in different operating systems (Windows, Linux, MacOS)</li> <li>▪ Getting to know different types of variables and therefore relevant operations</li> <li>▪ Learn about conditional statements, loops and other helpful execution functions</li> <li>▪ Object-oriented programming with Python</li> </ul>
<p><b>Form of exam</b></p>	<p>Written examination, duration 90-120 minutes, graded. The grade corresponds to the grade for the module.</p>
<p><b>Literature</b></p>	<ul style="list-style-type: none"> <li>▪ <i>Official Python Tutorial. <a href="https://docs.python.org/3/tutorial/index.html">https://docs.python.org/3/tutorial/index.html</a></i></li> <li>▪ <i>Mark Lutz. 2003. Learning Python (2nd. ed.). O'Reilly &amp; Associates, Inc., USA.</i></li> <li>▪ <i>Matthes E. Python Crash Course: A Hands-On Project-Based Introduction to Programming. No Starch Press; 2016.</i></li> </ul>

**General Chemistry (15262)**

<b>Module Title</b>	<b>General Chemistry</b> <i>[Allgemeine Chemie]</i>			
<b>Module Number</b>	<b>15262</b>			
<b>Module Responsibility</b>	Prof. Dr. rer. nat. Jürgen Zapp			
<b>Lecturer</b>	N.N. (Department of Life Science Technologies)			
<b>Degree Program</b>	General Engineering (B.Sc.)			
<b>Status</b>	Compulsory module	X	Compulsory elective module	
<b>Semester</b>	1			
<b>Forms of Teaching</b>	Lecture			
<b>Language of Teaching</b>	English			
<b>Hours per Week (SWS)</b>	Lecture	4	Other	/
<b>Workload (h)</b>	Lecture	60	Exercise	
	Seminar		Workshop	
	Excursion		Work Placement	
	Self-Study	45	Examination Preparation	45
<b>Workload total (h)</b>	150 h			
<b>Credits</b>	5			
<b>Prerequisites</b>	none			
<b>Focus on the Sustainability Goals (17 UN SGDs)</b>	<ul style="list-style-type: none"> <li>▪ SGD 2 – Zero hunger</li> <li>▪ SGD 3 – Good health and well-being</li> <li>▪ SGD 6 – Clean water and sanitation</li> <li>▪ SGD 12 – Responsible consumption and production</li> </ul>			
<b>Goal of study and competences</b>	<p>Students will gain an understanding of:</p> <ul style="list-style-type: none"> <li>▪ Basic laws of chemistry in the context of stoichiometric calculations of reaction processes</li> <li>▪ IUPAC naming rules to acids, salts and molecular compounds</li> <li>▪ Basic models for the structure of atoms and the periodicity of elements in the periodic table</li> <li>▪ The principles of different chemical bonding forms</li> </ul>			



	<ul style="list-style-type: none"> <li>▪ Chemical equilibria and application to dissolution processes, acid and base reactions and redox processes</li> <li>▪ The properties of selected chemical elements</li> </ul>
<b>Contents of study</b>	<ul style="list-style-type: none"> <li>▪ Introduction to chemistry: matter, chemical substances and chemical reactions, states of matter, chemical reactions and equations, quantities in chemical reactions, chemical formulas, atoms, molecules and ions, the gaseous state.</li> <li>▪ Atomic structure: atomic particles, structure of the electron shell</li> <li>▪ Chemical bonds: ionic bonds, covalent bonds, metallic bonding, polarized covalent bonds, intermolecular bonding; coordination complexes</li> <li>▪ Periodic properties of the elements</li> <li>▪ Reaction rates and chemical equilibrium</li> <li>▪ Solubility of electrolytes in aqueous solutions</li> <li>▪ Acids and bases: Acid-base concepts, pH, buffers, neutralization titrations</li> <li>▪ Redox reactions and electrochemistry: reduction and oxidation reactions, electrochemistry, electrolysis</li> <li>▪ Chemistry of selected main group elements</li> </ul>
<b>Form of exam</b>	Written Examination (80 min)
<b>Literature</b>	<ul style="list-style-type: none"> <li>▪ <i>Theodore Brown, H. LeMay, Bruce Bursten, Catherine Murphy, Patrick Woodward, Matthew Stoltzfus; Chemistry: The Central Science; Pearson Education Limited; 15. Edition (12. Oktober 2021)</i></li> <li>▪ <i>Philippa B. Cranwell, Elizabeth M. Page; Foundations of Chemistry: An Introductory Course for Science Students; Wiley; 1. Edition (12. August 2021)</i></li> </ul>

**Introduction to Physics (14984)**

<b>Module Title</b>	<b>Introduction to Physics</b> <i>[Einführung in Physik]</i>			
<b>Module Number</b>	<b>14984</b>			
<b>Module Responsibility</b>	Prof. Dr.-Ing. Eva Scheideler			
<b>Lecturer</b>	Prof. Dr.-Ing. Eva Scheideler / Prof. Dr. rer. nat. Ulrich Odefey			
<b>Degree Program</b>	General Engineering (B.Sc.)			
<b>Status</b>	Compulsory module	X	Compulsory elective module	
<b>Semester</b>	1			
<b>Forms of Teaching</b>	Lecture and exercise			
<b>Language of Teaching</b>	English			
<b>Hours per Week (SWS)</b>	Lecture	2	Exercise	2
<b>Workload (h)</b>	Lecture	30	Exercise	30
	Seminar		Workshop	
	Excursion		Work Placement	
	Self-Study	90	Examination Preparation	
<b>Workload total (h)</b>	150 h			
<b>Credits</b>	5			
<b>Prerequisites</b>				
<b>Focus on the Sustainability Goals (17 UN SGDs)</b>	<ul style="list-style-type: none"> <li>▪ SGD 4 – Quality education</li> <li>▪ SGD 5 – Gender equality</li> <li>▪ SGD 7 – Affordable and clean energy</li> <li>▪ SGD 12 – Responsible consumption and production</li> </ul>			
<b>Goal of study and competences</b>	<p>Students know the basic concepts and quantities of mechanics and can perform SI-physical calculations including error analysis on calculators and PCs with confidence.</p> <p>They know basic phenomena in the fields of mechanics and thermodynamics and are able to analyze these phenomena conceptually and apply the laws of conservation.</p> <p>In the key areas of electricity to the atomic shell, they acquire knowledge that serves as a basis for subsequent subjects</p>			

	<p>such as electrical engineering and automation technology.</p> <p>Moreover, these foundations enable the students to deepen their knowledge and develop it further independently in practice.</p> <p>Students will then be able to recognize physical relationships in development and construction.</p>
<b>Contents of study</b>	<ul style="list-style-type: none"> <li>▪ Kinematics</li> <li>▪ Dynamics</li> <li>▪ Work, energy, energy conservation, power</li> <li>▪ Vibrations</li> <li>▪ Fundamentals of fluid mechanics</li> <li>▪ Fundamentals of thermodynamics: Temperature, heat, ideal gases</li> <li>▪ Ray and wave optics</li> <li>▪ Wave particles</li> <li>▪ Atomic structure</li> <li>▪ Emission and absorption of light, LASER</li> <li>▪ Measurement methods and their application</li> </ul>
<b>Form of exam</b>	Written examination
<b>Literature</b>	<ul style="list-style-type: none"> <li>▪ <i>Fundamentals of Physics (David Halliday, Jearl Walker)</i></li> <li>▪ <i>Teach Yourself Physics: a travel companion (English Edition), Jakob Schwichtenberg, Kindle Edition</i></li> <li>▪ <i>PHET Colorado, Interactive Simulations for Science and Math</i> <a href="https://phet.colorado.edu">https://phet.colorado.edu</a></li> </ul>

**Electrical Engineering 1 (15123)**

<b>Module Title</b>	<b>Electrical Engineering 1</b> <i>[Elektrotechnik 1]</i>			
<b>Module Number</b>	<b>15123</b>			
<b>Module Responsibility</b>	Prof. Dr.-Ing. Thomas Schulte			
<b>Lecturer</b>	Prof. Dr.-Ing. Thomas Schulte / Prof. Dr.-Ing. Oliver Stübbe			
<b>Degree Program</b>	General Engineering (B.Sc.)			
<b>Status</b>	Compulsory module	X	Compulsory elective module	
<b>Semester</b>	1			
<b>Forms of Teaching</b>	Lecture and exercise			
<b>Language of Teaching</b>	English			
<b>Hours per Week (SWS)</b>	Lecture	2	Exercise	2
<b>Workload (h)</b>	Lecture	30	Exercise	30
	Seminar		Workshop	
	Excursion		Work Placement	
	Self-Study	90	Examination Preparation	
<b>Workload total (h)</b>	150 h			
<b>Credits</b>	5			
<b>Prerequisites</b>				
<b>Focus on the Sustainability Goals (17 UN SGDs)</b>	<ul style="list-style-type: none"> <li>▪ SGD 4 – Quality Education</li> <li>▪ SGD 7 – Affordable and Clean Energy</li> <li>▪ SGD 9 – Industry, Innovation, and Infrastructure</li> <li>▪ SGD 12 – Responsible Consumption and Production</li> </ul>			
<b>Goal of study and competences</b>	Students can analyze direct current circuits and homogeneous, time-constant fields. They can apply this technical competence as methodological competence to typical practical problems and interpret the results. Students have the ability to confidently apply methods and models to solve problems relating to direct current circuits and homogeneous time-constant fields in electrical engineering.			
<b>Contents of study</b>	<b>Lecture:</b>			

	<ul style="list-style-type: none"> <li>▪ <b>Basics</b> Current, voltage, potential, power, energy, resistance, independent sources</li> <li>▪ <b>DC circuits</b> One-port network, Kirchhoff laws, parallel circuit, series circuit, equivalent one-ports, potentiometer, bridge circuit,</li> <li>▪ <b>Homogeneous time constant fields</b> Flow field, electrostatic field, magnetic field</li> </ul> <p><b>Exercise:</b></p> <ul style="list-style-type: none"> <li>▪ Practical application examples will be presented to accompany the lecture contents. Homework will be corrected if possible and explained in the tutorial.</li> </ul>
<b>Form of exam</b>	Written examination, duration 90 minutes, graded. The grade corresponds to the grade for the module.
<b>Literature</b>	<ul style="list-style-type: none"> <li>▪ <i>Electrical Engineering: Fundamentals</i> Viktor Hacker, Christof Sumeder Wien: De Gruyter Oldenbourg</li> <li>▪ <i>U. Meier, O. Stübbe</i> <i>Elektrotechnik zum Selbststudium - Grundlagen und Vertiefung</i> Springer Vieweg, Wiesbaden 2022</li> </ul>

**Mathematics 2 (15232)**

<b>Module Title</b>	<b>Mathematics 2</b> <i>[Mathematik 2]</i>			
<b>Module Number</b>	<b>15232</b>			
<b>Module Responsibility</b>	Prof. Dr. rer. nat. Jens Wallys			
<b>Lecturer</b>	Prof. Dr. rer. nat. Jens Wallys			
<b>Degree Program</b>	General Engineering (B.Sc.)			
<b>Status</b>	Compulsory module	X	Compulsory elective module	
<b>Semester</b>	2			
<b>Forms of Teaching</b>	Lecture and exercise			
<b>Language of Teaching</b>	English			
<b>Hours per Week (SWS)</b>	Lecture	2	Exercise	2
<b>Workload (h)</b>	Lecture	30	Exercise	30
	Seminar		Workshop	
	Excursion		Work Placement	
	Self-Study	90	Examination Preparation	
<b>Workload total (h)</b>	150 h			
<b>Credits</b>	5			
<b>Prerequisites</b>	The module “Mathematics 1” of the first semester should have been completed.			
<b>Focus on the Sustainability Goals (17 UN SGDs)</b>	<ul style="list-style-type: none"> <li>▪ SGD 4 – Quality Education</li> <li>▪ SGD 7 – Affordable and Clean Energy</li> <li>▪ SGD 9 – Industry, Innovation, and Infrastructure</li> <li>▪ SGD 12 – Responsible Consumption and Production</li> </ul>			
<b>Goal of study and competences</b>	Students deepen their understanding of the modeling of technical relationships by examining the concept of functions in more detail. Continuity, differentiability and integrability can be recognized in applications and applied to modeling. Typical problems can be solved.			
<b>Contents of study</b>	<ul style="list-style-type: none"> <li>▪ Fundamentals of function theory</li> <li>▪ Differential calculus</li> </ul>			

	<ul style="list-style-type: none"> <li>▪ Fundamental theorem of differential calculus</li> <li>▪ Extreme value problems</li> <li>▪ Optimization problems</li> <li>▪ Integral calculus             <ul style="list-style-type: none"> <li>▪ Fundamental theorem of integral calculus</li> <li>▪ Various integration methods</li> <li>▪ Multiple integrals</li> </ul> </li> <li>▪ Vector analysis             <ul style="list-style-type: none"> <li>▪ Gradient</li> <li>▪ Hesse- / Jacobi-Matrix</li> </ul> </li> <li>▪ Differential equations             <ul style="list-style-type: none"> <li>▪ Linear 1st and 2nd Order</li> </ul> </li> <li>▪ Introduction to numerics             <ul style="list-style-type: none"> <li>▪ Newton method</li> <li>▪ Numerical integration</li> </ul> </li> </ul> <p><b>Exercises:</b> Aim at a deeper understanding of the lecture contents.</p>
<b>Form of exam</b>	Written examination, duration 90-120 minutes, graded. The grade corresponds to the grade for the module.
<b>Literature</b>	<ul style="list-style-type: none"> <li>▪ <i>John Shannon; Mathematics for Business, Economics &amp; Finance, Wiley, 1995.</i></li> <li>▪ <i>Kwong-Tin Tang: Mathematical Methods for Engineers and Scientists 1 and 2, Springer, 2007.</i></li> <li>▪ <i>Jagdish C. Arya, Robin W. Lardner: Mathematical Analysis, Englewoods Clifs, 1993.</i></li> <li>▪ <i>K. A. Stroud: Engineering Mathematics, Bloomsbury Academic, 2020</i></li> </ul>

## Basics of Digitalization (15195)

<b>Module Title</b>	<b>Basics of Digitalization</b> <i>[Grundlagen der Digitalisierung]</i>			
<b>Module Number</b>	<b>15195</b>			
<b>Module Responsibility</b>	Prof. Dr.-Ing. Lukasz Wisniewski			
<b>Lecturer</b>	Prof. Dr.-Ing. Lukasz Wisniewski			
<b>Degree Program</b>	General Engineering (B.Sc.)			
<b>Status</b>	Compulsory module	X	Compulsory elective module	
<b>Semester</b>	2			
<b>Forms of Teaching</b>	Lecture and exercise			
<b>Language of Teaching</b>	English			
<b>Hours per Week (SWS)</b>	Lecture	2	Exercise	2
<b>Workload (h)</b>	Lecture	30	Exercise	30
	Seminar		Workshop	
	Excursion		Work Placement	
	Self-Study	90	Examination Preparation	
<b>Workload total (h)</b>	150 h			
<b>Credits</b>	5			
<b>Prerequisites</b>	Basic knowledge according to the admission requirements for the degree program.			
<b>Focus on the Sustainability Goals (17 UN SGDs)</b>	<ul style="list-style-type: none"> <li>▪ SGD 4 – Quality Education</li> <li>▪ SGD 7 – Affordable and Clean Energy</li> <li>▪ SGD 9 – Industry, Innovation, and Infrastructure</li> <li>▪ SGD 12 – Responsible Consumption and Production</li> </ul>			
<b>Goal of study and competences</b>	<ul style="list-style-type: none"> <li>▪ Getting to know basic principles of digitalization</li> <li>▪ Assessment of the significance of digitization (both technologically and socially)</li> <li>▪ Recognition of potentials of digitalization</li> <li>▪ Critical examination of digital changes</li> <li>▪ Estimating what possible changes make sense in the company and which don't</li> </ul>			



	<ul style="list-style-type: none"> <li>▪ Conscious application of technology to optimize various analogue processes or important use cases</li> </ul>
<b>Contents of study</b>	<ul style="list-style-type: none"> <li>▪ The students are confronted with the most important aspects of digitalization in industry.</li> <li>▪ They will learn what effects digitalization has on production processes, organization, business models and also on people.</li> <li>▪ One of the focuses is also to understand which positive and negative aspects are associated with digitalization.</li> <li>▪ The learning content is provided with many different examples from areas such as Internet of Things (IoT), artificial intelligence (AI), apps, 3D printing and many others so that the diverse effects of digitalization are understandable.</li> </ul> <p>As the exercise progresses, small teams work on a specific digitalization challenge, where a possible digitalization concept is developed.</p>
<b>Form of exam</b>	Semester project (50%), written examination (50%) 60min.
<b>Literature</b>	<ul style="list-style-type: none"> <li>▪ <i>Andrew McAfee, Erik Brynjolfsson, Machine, Platform, Crowd: Harnessing Our Digital Future, W. W. Norton &amp; Company, 2018.</i></li> <li>▪ <i>Thomas M. Siebel. Digital Transformation: Survive and Thrive in an Era of Mass Extinction. RosettaBooks, New York, NY, 2019.</i></li> <li>▪ <i>Ronald Tocci, Neal Widmer, and Greg Moss. 2006. Digital Systems: Principles and Applications (10th Edition). Prentice-Hall, Inc., USA.</i></li> <li>▪ <i>Andrew S. Tanenbaum and David J. Wetherall. 2010. Computer Networks (5th. ed.). Prentice Hall Press, USA.</i></li> </ul>

## Materials Science (15226)

<b>Module Title</b>	<b>Materials Science</b> <i>[Werkstoffkunde]</i>			
<b>Module Number</b>	<b>15226</b>			
<b>Module Responsibility</b>	Prof. Dr.-Ing. Jozef Balun			
<b>Lecturer</b>	Prof. Dr.-Ing. Jozef Balun			
<b>Degree Program</b>	General Engineering (B.Sc.)			
<b>Status</b>	Compulsory module	x	Compulsory elective module	
<b>Semester</b>	2			
<b>Forms of Teaching</b>	Lecture and exercise			
<b>Language of Teaching</b>	English			
<b>Hours per Week (SWS)</b>	Lecture	2	Exercise	2
<b>Workload (h)</b>	Lecture	30	Exercise	30
	Seminar		Workshop	
	Excursion		Work Placement	
	Self-Study	90	Examination Preparation	
<b>Workload total (h)</b>	60 hours of face-to-face units (lectures and exercises), 90 hours of additional student individual work/homework time. Total Workload: 150 h			
<b>Credits</b>	5			
<b>Prerequisites</b>				
<b>Focus on the Sustainability Goals (17 UN SGDs)</b>	<ul style="list-style-type: none"> <li>▪ <b>SGD 9 – Industry, Innovation, and Infrastructure</b> The promotion of research and innovation in materials science can contribute to the development of new sustainable materials and technologies, thereby contributing to the achievement of SGD 9.</li> <li>▪ <b>SGD 11 – Sustainable Cities and Communities</b> By researching and applying sustainable materials in construction and infrastructure, we contribute to promoting urban resilience and supporting the development of liveable, resilient cities in line with SGD 11.</li> </ul>			

	<ul style="list-style-type: none"> <li>▪ <b>SGD 14 – Life below Water</b> Considering the environmental impact of packaging materials helps protect marine and terrestrial environments by preferring sustainable materials and manufacturing methods (SGD 14).</li> <li>▪ <b>SGD 15 – Life on Land</b> The investigation and application of methods to prevent material degradation, such as corrosion and wear, support the preservation of terrestrial habitats (SGD 15) and promote the sustainable use of natural resources.</li> </ul>
<p><b>Goal of study and competences</b></p>	<ul style="list-style-type: none"> <li>▪ Students should develop the ability to classify materials and understand the fundamental properties of crystalline and amorphous substances.</li> <li>▪ They should also become acquainted with various methods of material testing and be able to apply them to determine essential material characteristics.</li> <li>▪ Students should understand the properties of construction materials such as metals, plastics, composite materials, and wood in order to select appropriate materials for different applications.</li> <li>▪ Students should develop an awareness of sustainability goals and comprehend how material selection, recycling, and other practices contribute to achieving these objectives.</li> <li>▪ Additionally, students should understand the application of functional materials, particularly in terms of electrical conductivity, magnetism, magnetostriction, and the piezoelectric effect.</li> </ul>
<p><b>Contents of study</b></p>	<p>Overview of the field, historical context, and its significance in various industries. Classification of materials. Structure and properties of crystalline and amorphous substances. Methods of material testing to determine essential material characteristics. Properties of construction materials (metals and their alloys, plastics, composite materials, wood) and packaging materials. Surface characteristics of stainless steels. Recycling. Fundamentals of functional materials (electrical conductivity, magnetism, magnetostriction, piezoelectric effect). Possibilities for improving material properties through heat treatment (strengthening and softening mechanisms in metals). Mechanisms of material degradation (corrosion, wear, fatigue, aging) and methods of prevention. Fundamentals of systematic material selection.</p>

<b>Form of exam</b>	Written examination, duration 60 minutes.
<b>Literature</b>	<ul style="list-style-type: none"><li>▪ <i>Callister W. D. Jr. Fundamentals of Materials Science and Engineering John Wiley, 2001</i></li><li>▪ <i>Bargel H.-J., Schulze G. Werkstoffkunde. 12. Aufl. Springer Vieweg, 2018</i></li><li>▪ <i>Weißbach W., Dahms M., Jaroschek Ch. Werkstoffe und ihre Anwendungen. 20. Aufl. Springer Vieweg, 2018</i></li></ul>

## Technical Mechanics 1 – Statics (15198)

<b>Module Title</b>	<b>Technical Mechanics 1 – Statics</b> <i>[Technische Mechanik 1 – Statik]</i>			
<b>Module Number</b>	15198			
<b>Module Responsibility</b>	Prof. Dr.-Ing. Kim-Henning Sauerland			
<b>Lecturer</b>	Prof. Dr.-Ing. Kim-Henning Sauerland			
<b>Degree Program</b>	General Engineering (B.Sc.)			
<b>Status</b>	Compulsory module	X	Compulsory elective module	
<b>Semester</b>	2			
<b>Forms of Teaching</b>	Lecture and practical work			
<b>Language of Teaching</b>	English			
<b>Hours per Week (SWS)</b>	Lecture	2	Practical Work	2
<b>Workload (h)</b>	Lecture	30	Practical Work	30
	Seminar		Workshop	
	Excursion		Work Placement	
	Self-Study	90	Examination Preparation	
<b>Workload total (h)</b>	150 h			
<b>Credits</b>	5			
<b>Prerequisites</b>	Recommended: Introduction to Physics			
<b>Focus on the Sustainability Goals (17 UN SGDs)</b>	<ul style="list-style-type: none"> <li>▪ <b>SGD 5 – Gender Equality</b> This course provides broad basic knowledge related to the design of machines, facilities, components and constructions. A later career entry in this special field does not place any demands on certain physical requirements, so that women can pursue their careers in this field on an equal footing with men.</li> <li>▪ <b>SGD 9 – Industry, Innovation, and Infrastructure</b> This course provides broad mathematical and scientific methods which address and may solve current challenges, particularly regarding traffic, energy, production and efficiency.</li> </ul>			

	<ul style="list-style-type: none"> <li>▪ <b>SGD 12 – Responsible Consumption and Production</b> This course provides fundamental basics regarding lightweight construction and hence fosters a permanent engagement with aspects of resource efficiency and energy efficiency.</li> </ul>
<b>Goal of study and competences</b>	<ul style="list-style-type: none"> <li>▪ Students repeat fundamental concepts of mathematics and physics in the context of statics</li> <li>▪ Students understand fundamental contexts of statics</li> <li>▪ Students get familiar with engineering competencies based on natural sciences: abstraction, model description, problem solving, result interpretation</li> <li>▪ Students understand decomposition and composition of forces and moments</li> <li>▪ Students calculate bearing forces and bearing moments for static loading</li> <li>▪ Students calculate stress resultants and they interpret distributions of stress resultants</li> <li>▪ Students make distinctions between bonding and friction and they apply appropriate laws to rigid bodies</li> <li>▪ Within lecture-attendant labs students solve tasks independently as well as in teamwork</li> <li>▪ Students convert learned and acquired knowledge into specific examples of use</li> </ul>
<b>Contents of study</b>	<ul style="list-style-type: none"> <li>▪ Introduction: forces, moments, terms and axioms of statics</li> <li>▪ Forces and moments in plane and in space, central and general force systems, balance equations, statical determinedness, bearing forces, multi-body systems</li> <li>▪ Statical structures: beams, frames, frameworks</li> <li>▪ Center of gravity: mass, area, volume</li> <li>▪ Stress resultants in plane and in space</li> <li>▪ Basics of bonding and friction, rope bonding and rope friction</li> <li>▪ Mechanical work of forces and moments</li> </ul>
<b>Form of exam</b>	Written examination, 90 min
<b>Literature</b>	<ul style="list-style-type: none"> <li>▪ <i>Gross, Hauger, Schröder, Wall, Rajapakse: Engineering Mechanics 1 – Statics, Springer 2009</i></li> <li>▪ <i>Hibbeler: Engineering Mechanics – Statics, Pearson 2021</i></li> <li>▪ <i>Mahnken: Lehrbuch der Technischen Mechanik – Band 1: Starrkörperstatik, Springer Vieweg 2016</i></li> </ul>

## General Engineering (PRACTICE) (15029)

<b>Module Title</b>	<b>General Engineering (PRACTICE)</b> <i>[General Engineering (PRAXIS)]</i>			
<b>Module Number</b>	<b>15029</b>			
<b>Module Responsibility</b>	Prof. Dr.-Ing. Andreas Paa			
<b>Lecturer</b>	Prof. Dr.-Ing. Andreas Paa, Prof. Dr.-Ing. Georg Klepp, Prof. Dr.-Ing. Jozef Balun, Prof. Dr. rer. nat. Thomas Gassenmeier, and others			
<b>Degree Program</b>	General Engineering (B.Sc.)			
<b>Status</b>	Compulsory module	X	Compulsory elective module	
<b>Semester</b>	2			
<b>Forms of Teaching</b>	Practical work, partly prepared in seminar style.			
<b>Language of Teaching</b>	English			
<b>Hours per Week (SWS)</b>	Lecture	4	Practical Work	
<b>Workload (h)</b>	Lecture	20	Practical Work	40
	Seminar		Workshop	
	Excursion		Work Placement	
	Self-Study	90	Examination Preparation	
<b>Workload total (h)</b>	150 h			
<b>Credits</b>	5			
<b>Prerequisites</b>	None			
<b>Focus on the Sustainability Goals (17 UN SGDs)</b>	<ul style="list-style-type: none"> <li>▪ SGD 4 – Quality Education: Skills for fair, respectful and cooperative interaction are promoted through group work.</li> <li>▪ SGD 7 – Affordable and Clean Energy: Methods of providing clean energy economically are conveyed.</li> <li>▪ SGD 9 – Industry, Innovation, and Infrastructure: The infrastructure required for the distribution of information, energy and transportation is covered.</li> <li>▪ SGD 12 – Responsible Consumption and Production: This module directly addresses methods for the energy-efficient design and operation of systems of all kinds, as well as</li> </ul>			

	<p>sustainability aspects and safety aspects for humans, animals and the environment.</p>
<p><b>Goal of study and competences</b></p>	<p>After successfully completing the module, students can ...</p> <ul style="list-style-type: none"> <li>▪ <b>Understand and apply</b> <ul style="list-style-type: none"> <li>... comprehend and describe the basics of energy conversion, process engineering, fluid mechanics, electrical engineering, communication technology and other engineering disciplines as well as complex processes in systems.</li> <li>... access basic knowledge of the design and operation of systems from the specialist disciplines covered.</li> <li>... contextualise the safety requirements placed on systems.</li> <li>... use and apply analogue and digital measurement data acquisition and interpret the measured results.</li> <li>... select different drive and propulsion engineering concepts according to the requirements.</li> <li>... understand the equations of motion laws, power, energy and other important key data for engineering applications.</li> <li>... understand and evaluate the basic material properties and the associated characteristic values and differentiate between areas of application.</li> <li>... distinguish raw materials and the special requirements for food production methods.</li> </ul> </li> <li>▪ <b>Analyse, evaluate and create new knowledge</b> <ul style="list-style-type: none"> <li>... use the acquired knowledge and deepen it on a theoretical level in the subsequent lectures.</li> <li>... apply advanced skills to ensure the sustainable and economical construction and operation of plants.</li> <li>... select suitable components, materials and process sequences for modern systems.</li> </ul> </li> <li>▪ <b>Communication and collaboration</b> <ul style="list-style-type: none"> <li>... evaluate the results of their or other students' work on the basis of knowledge, skills and competences taught in the module and assess them from various points of view.</li> <li>... develop solutions to laboratory tasks in group work.</li> <li>... present technical issues and obtained results in writing and/or orally.</li> </ul> </li> </ul>
<p><b>Contents of study</b></p>	<p>Relevant practical experiments from the following engineering areas:</p> <ul style="list-style-type: none"> <li>▪ Digital Production Engineering</li> <li>▪ Electrical Engineering</li> <li>▪ Computer Science</li> </ul>



	<ul style="list-style-type: none"> <li>▪ Food Technology</li> <li>▪ Life Sciences: Industrial Pharmacy, Biotechnology and Cosmetic Technology</li> <li>▪ Wood Technology</li> <li>▪ Mechanical Engineering</li> <li>▪ Mechatronics</li> <li>▪ Virtual Product Development</li> </ul>
<p><b>Form of exam</b></p>	<p>Prerequisites for participation in the respective experiments:</p> <ul style="list-style-type: none"> <li>▪ Successful participation in the relevant safety training must not date back more than one year.</li> <li>▪ To ensure the safety of man and machine, the participants must have familiarised themselves with the documents provided before the experiment.</li> </ul> <p>Exam prerequisite:</p> <ul style="list-style-type: none"> <li>▪ Admission requirements (in accordance with Section 16(2) of the General part) for the examination, proof of active participation in at least 80% of the practical course experiments and submission of a report on each practical course experiment. You will receive information on the practical course experiments at the start of the module.</li> </ul> <p>Exam:</p> <ul style="list-style-type: none"> <li>▪ E-examination or written examination of 90 minutes or oral examination, each ungraded.</li> </ul>
<p><b>Literature</b></p>	<p><i>According to the documents provided.</i></p>

## SEMESTERS 1-2: Entry Phase – Languages

### German A1 (14987)

<b>Module Title</b>	<b>German A1</b> <i>[Deutsch A.1]</i>			
<b>Module Number</b>	<b>14987</b>			
<b>Module Responsibility</b>	Dr. (U Penn) Siegbert Klee			
<b>Lecturer</b>	Dr. (U Penn) Siegbert Klee, N.N.			
<b>Degree Program</b>	General Engineering (B.Sc.)			
<b>Status</b>	Compulsory module		Compulsory elective module	X
<b>Semester</b>	Winter semester			
<b>Forms of Teaching</b>	Exercise / language practice exercise			
<b>Language of Teaching</b>	German / English			
<b>Hours per Week (SWS)</b>	Lecture		Exercise	4
<b>Workload (h)</b>	Lecture		Exercise	56
	Seminar		Workshop	
	Excursion		Work Placement	
	Self-Study	94	Examination Preparation	
<b>Workload total (h)</b>	150 h			
<b>Credits</b>	5			
<b>Prerequisites</b>				
<b>Focus on the Sustainability Goals (17 UN SGDs)</b>	<ul style="list-style-type: none"> <li>▪ SGD 4 – Quality Education</li> <li>▪ SGD 17 – Partnerships for the Goals</li> </ul>			
<b>Goal of study and competences</b>	<ul style="list-style-type: none"> <li>▪ Can understand and use familiar everyday expressions and very basic phrases aimed at the satisfaction of needs of a concrete type.</li> <li>▪ Can introduce him/herself and others and can ask and answer questions about personal details such as where he/she lives, people he/she knows and things he/she has.</li> </ul>			

	<ul style="list-style-type: none"> <li>▪ Can interact in a simple way provided the other person talks slowly and clearly and is prepared to help.</li> </ul>
<b>Contents of study</b>	<ul style="list-style-type: none"> <li>▪ Greeting and introducing yourself and others (formal/informal)</li> <li>▪ Understand and use numbers (e.g. in telephone numbers)</li> <li>▪ Talk about family and country of origin</li> <li>▪ Understand simple information texts and conversations (e.g. appointments)</li> <li>▪ Understand times, times of day, seasons and numbers, talk about appointments</li> <li>▪ Understand and note down names for food and types of packaging</li> <li>▪ Discuss with others what you can/must/may/want or would like to do</li> <li>▪ Talk about leisure activities, hobbies and sports</li> <li>▪ Understand information in advertisements and on websites</li> <li>▪ Express likes and dislikes</li> <li>▪ Plan activities (e.g. in the evening or at the weekend)</li> <li>▪ Discuss purchasing decisions (e.g. furniture)</li> <li>▪ Understand and formulate written instructions</li> <li>▪ Understand information about places and landmarks</li> <li>▪ Understand and give directions</li> <li>▪ Understand and respond to reports (e.g. in emails) about experiences</li> </ul>
<b>Form of exam</b>	Final test Start German A1 (written and oral; at the end of the winter semester or before the A2 course in the summer semester)
<b>Literature</b>	<ul style="list-style-type: none"> <li>▪ <i>Kurs DaF A1 Deutsch für Studium und Beruf. Kurs- und Übungsbuch mit Audios und Videos (Course and exercise book, Klett Publishing house, compulsory basis)</i></li> </ul> <p><i>Further useful sources of information:</i></p> <ul style="list-style-type: none"> <li>▪ <a href="http://www.tatsachen-ueber-deutschland.de/en">www.tatsachen-ueber-deutschland.de/en</a></li> <li>▪ <a href="http://www.study-in-germany.de/en">www.study-in-germany.de/en</a></li> <li>▪ <a href="http://www.make-it-in-germany.com">www.make-it-in-germany.com</a></li> </ul>
<b>Last update</b>	08.01.2025

## Business/Technical English (15122)

<b>Module Title</b>	<b>Business/Technical English</b> <i>[Business/Technisches Englisch]</i>			
<b>Module Number</b>	<b>15122</b>			
<b>Module Responsibility</b>	Department of Life Science Technologies			
<b>Lecturer</b>	Mrs. Eleanor Penner			
<b>Degree Program</b>	General Engineering (B.Sc.)			
<b>Status</b>	Compulsory module		Compulsory elective module	X
<b>Semester</b>	1			
<b>Forms of Teaching</b>	Lecture with integrated exercises			
<b>Language of Teaching</b>	English			
<b>Hours per Week (SWS)</b>	Lecture	4	Other	
<b>Workload (h)</b>	Lecture	60	Exercise	
	Seminar		Workshop	
	Excursion		Work Placement	
	Self-Study	90	Examination Preparation	
<b>Workload total (h)</b>	150 h			
<b>Credits</b>	5			
<b>Prerequisites</b>	English B2 Level			
<b>Focus on the Sustainability Goals (17 UN SGDs)</b>	<ul style="list-style-type: none"> <li>▪ SGD 4 – Quality Education</li> <li>▪ SGD 17 – Partnerships for the Goals</li> </ul>			
<b>Goal of study and competences</b>	This course intends to advance active communication skills, in order to function adequately in a professional career environment. Its main emphasis is, therefore, on developing the ability to competently and professionally deal with situations requiring good knowledge of technological and business-related English.			
<b>Contents of study</b>	<ul style="list-style-type: none"> <li>▪ The aim of this course is to further the already existing working knowledge of the English language in regard to the professional and science related day-to-day requirements.</li> </ul>			

	<ul style="list-style-type: none"> <li>▪ Along with the introduction of relevant vocabulary, the course includes             <ul style="list-style-type: none"> <li>▪ Reading about and discussing technical subjects</li> <li>▪ Listening-, comprehension- and writing exercises</li> <li>▪ Translations</li> <li>▪ Honing of one’s technical and personal presentation skills</li> </ul> </li> <li>▪ Students will be expected to actively train their communication skills in simulations of typical, job-related situations, such as professional and personal presentations and interactions</li> </ul>
<b>Form of exam</b>	Written examination (80 min.)
<b>Literature</b>	<ul style="list-style-type: none"> <li>▪ <i>Students have access to a reference collection of course-related literature in the library, which is updated every semester.</i></li> </ul>

## German A2 (15192)

<b>Module Title</b>	<b>German A2</b> <i>[Deutsch A2]</i>			
<b>Module Number</b>	<b>15192</b>			
<b>Module Responsibility</b>	Dr. (U Penn) Siegbert Klee			
<b>Lecturer</b>	Dr. (U Penn) Siegbert Klee, N.N.			
<b>Degree Program</b>	General Engineering (B.Sc.)			
<b>Status</b>	Compulsory module		Compulsory elective module	X
<b>Semester</b>	2			
<b>Forms of Teaching</b>	Exercise / language practice exercise			
<b>Language of Teaching</b>	German / English			
<b>Hours per Week (SWS)</b>	Lecture		Seminar	4
<b>Workload (h)</b>	Lecture		Exercise	
	Seminar	56	Workshop	
	Excursion		Work Placement	
	Self-Study	94	Examination Preparation	
<b>Workload total (h)</b>	150 h			
<b>Credits</b>	5			
<b>Prerequisites</b>	Test Start German A1 or equivalent			
<b>Focus on the Sustainability Goals (17 UN SGDs)</b>	<ul style="list-style-type: none"> <li>▪ SGD 4 – Quality Education</li> <li>▪ SGD 17 – Partnerships for the Goals</li> </ul>			
<b>Goal of study and competences</b>	<ul style="list-style-type: none"> <li>▪ Can understand sentences and frequently used expressions related to areas of most immediate relevance (e.g. very basic personal and family information, shopping, local geography, employment).</li> <li>▪ Can communicate in simple and routine tasks requiring a simple and direct exchange of information on familiar and routine matters.</li> <li>▪ Can describe in simple terms aspects of his/her background, immediate environment and matters in areas of immediate need.</li> </ul>			

<p><b>Contents of study</b></p>	<ul style="list-style-type: none"> <li>▪ Understand invitations, write acceptances and refusals</li> <li>▪ Make considerations, make suggestions and formulate reasons (e.g. for gifts, participation or non-participation)</li> <li>▪ Plan celebrations, festivities, parties, etc.</li> <li>▪ Understand conversations and texts on the subject of housing (viewing, renting/letting, furnishing, renovating)</li> <li>▪ Verbalize experiences of foreignness (new in the city, going abroad, studying abroad, foreign languages and dialects)</li> <li>▪ Carry out banking transactions (opening an account, depositing/withdrawing money) and understand simple conversations (bank, insurance, police, lost and found office, etc.)</li> <li>▪ Describe symptoms and complaints and find a suitable doctor</li> <li>▪ Arrange a doctor's appointment and follow up the doctor-patient consultation</li> <li>▪ Understand important health information and talk about their own health (including the terminology of the human body)</li> <li>▪ Prepare to buy clothes, etc., understand the conversation between the sales clerk and customer</li> <li>▪ Know and be able to categorize German festivals and holidays</li> </ul>
<p><b>Form of exam</b></p>	<p>Test equivalent to Goethe-Zertifikat A2 (written and oral; at the end of the summer semester or before the B1 course in the winter semester)</p>
<p><b>Literature</b></p>	<ul style="list-style-type: none"> <li>▪ <i>Kurs DaF A2 Deutsch für Studium und Beruf. Kurs- und Übungsbuch mit Audios und Videos (Course and exercise book, Klett Publishing house, compulsory basis)</i></li> </ul> <p><i>Further useful sources of information:</i></p> <ul style="list-style-type: none"> <li>▪ <a href="http://www.tatsachen-ueber-deutschland.de/en">www.tatsachen-ueber-deutschland.de/en</a></li> <li>▪ <a href="http://www.study-in-germany.de/en">www.study-in-germany.de/en</a></li> <li>▪ <a href="http://www.make-it-in-germany.com">www.make-it-in-germany.com</a></li> </ul>
<p><b>Last update</b></p>	<p>08.01.2025</p>

## Presenting in English (15040)

<b>Module Title</b>	<b>Presenting in English</b> <i>[Präsentieren in Englisch]</i>			
<b>Module Number</b>	<b>15040</b>			
<b>Module Responsibility</b>	Dr. (U Penn) Siegbert Klee (LfbA)			
<b>Lecturer</b>	Dr. (U Penn) Siegbert Klee (LfbA)			
<b>Degree Program</b>	General Engineering (B.Sc.)			
<b>Status</b>	Compulsory module		Compulsory elective module	X
<b>Semester</b>	2			
<b>Forms of Teaching</b>	Lecture and tutorial / seminar / workshop			
<b>Language of Teaching</b>	English			
<b>Hours per Week (SWS)</b>	Lecture		Other	
<b>Workload (h)</b>	Lecture		Exercise	
	Seminar		Workshop	
	Excursion		Work Placement	
	Self-Study		Examination Preparation	
<b>Workload total (h)</b>	150 h			
<b>Credits</b>	5			
<b>Prerequisites</b>	None			
<b>Focus on the Sustainability Goals (17 UN SGDs)</b>	<ul style="list-style-type: none"> <li>▪ SGD 4 – Quality Education: Communication as an essential element of professional and intercultural cooperation</li> <li>▪ SGD 17 – Partnerships for the Goals: Skills for fair, respectful and cooperative interaction are promoted through group work.</li> </ul>			
<b>Goal of study and competences</b>	<ul style="list-style-type: none"> <li>▪ Develop insight into effective presentation techniques;</li> <li>▪ Increase your skills in applying presentation techniques in a range of situations (presenting research for experts or mixed audiences, formally in a conference setting or informally for a small audience)</li> </ul>			



<b>Contents of study</b>	<ul style="list-style-type: none"> <li>▪ Preparation of a presentation: from abstract to performance</li> <li>▪ Delivery skills: voice, posture, eye contact, show enthusiasm</li> <li>▪ Keeping audience attentive with narrative rhetorical skills</li> <li>▪ Managing questions, reflect on individual presentation skills</li> </ul>
<b>Form of exam</b>	Composition / presentation / colloquium
<b>Literature</b>	<ul style="list-style-type: none"> <li>▪ <i>Van der Laaken, M. &amp; Van der Laaken, B. (2013). Presentation Techniques. 2nd. ed. Bussum: Coutinho.</i></li> </ul>
<b>Last update</b>	08.01.2025