Module Handbook

Sustainable Resources, Engineering and Management – StREaM

Bachelor of Engineering (B. Eng.)

Official Notices related to the
Study and Examination Regulations:

Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)

Enrolment: April 1, 2025 (summer semester 2025)

Table of Contents

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**		Module no.:	**1.1**
		Semester:	**1**
		WHS:	**3**
		Credit points:	**5**
Modulbezeichnung *Module title*	**1.1 Sustainable Development (Interdisciplinary Introduction)**		
Modulniveau *Module level*	Bachelor programme level		
Modulverantwortliche:r *Module leader*	Prof. Dr. rer. nat. Petra Schneider		
Dozent:in *Teaching personnel*	Prof. Dr. rer. nat. Petra Schneider and other lecturers		
Sprache *Language*	English		
Zuordnung zum Curriculum, Modultyp *Curriculum, Type of module*	StREaM, Compulsory module		
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	3 WHS Lecture		
Arbeitsaufwand *Student workload*	150 Hrs. Total 45 Hrs. Contact time 105 Hrs. Self-study		
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	See Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)		
Empfohlene Voraussetzungen *Recommended prerequisites*			
Modulziele / Angestrebte Lernergebnisse *Module objectives / Learning outcomes*	Based on the UN Sustainable Development Goals (SDG) and the resulting Agenda 2030, this interdisciplinary lecture provides an overview of the different dimensions of sustainability and sustainable development. It introduces the history, fundamentals and challenges *of* as well as the need *for* sustainable resource management and allows students to identify opportunities and threats linked to this topic. Upon completion of this module, students will be able to: - demonstrate awareness of the dimensions of sustainable development, the UN Sustainable Development Goals (SDG) 2030 and their implications for social, economic and ecological development on all scales. - identify societal challenges resulting from resource scarcity and environmental impacts and get an idea on how to overcome them - understand the link between natural resource management, the value chain of products, globalisation effects, urbanisation and digitalisation.		
Inhalt *Contents*	Sustainable development is defined as "development that meets the needs of the present without risking that future generations will not be able to meet their own needs" (WCED UN, 1987)*. Within this framework, sustainable development is an organising principle for meeting human development goals while simultaneously sustaining the ability of natural systems to provide the		

	natural resources and ecosystem services on which the economy and society depend. The desired result is a state of society where living conditions and resources are used to continue to meet human needs without undermining the integrity and stability of the natural system. The sessions of the lecture will deal with sub-topics such as: - Fundamentals of sustainability - Global change and global population development - Global warming as well as drivers and impacts of climate change - Challenges of global economics - Value chains, globalisation and regionalisation - Responsible production and consumption - Circular economy - Living in and with ecosystems - Resilient cities and communities - Energy as a core driver - Zransforming management and business * https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf
Prüfungsleistungen *Type of examination*	Term paper (TP)
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	Use of media: blackboard, presentations, video, audio, Moodle learning platform, message forum, literature, computer. Forms of work: face-to-face events, online events, discussions, group work (small groups working on specific topics), literature study.
Literatur *Bibliography*	**Monographies and chapters in edited books** T., R. Kerry, "Sustainability, Resource Conservation and Pollution Control: An Overview," in *Sustainable Environmental Management*. London: Belhaven Press, UK, 1988. W. McDonough and M. Braungart, *Cradle to Cradle: Remaking the Way We Make Things.* NY, USA: North Point Press, 2002. D.H. Meadows, J. Randers and D.L. Meadows, *Limits to Growth: The 30-Year Update.* White River Junction, Vermont, USA: Chelsea Green Publishing, 2004. P. Brunner and P. Baccini, *Metabolism of the Anthroposphere: Analysis, Evaluation, Design,* 2nd ed. Cambridge, Mass, USA: MIT Press, 2012. P. Brunner and H. Rechberger, *Integrated Resource and Waste Management (Advanced Methods in Resource & Waste Management).* Florida, USA: CRC Press, 2005. **Journal articles and other sources** J. Elkington, “Triple Bottom Line," *The Economist*. Nov. 2009. M. Faber, "How to be an ecological economist," *Ecological Economics*, vol. 66 (1): 1–7, Jan. 2008, doi:10.1016/j.ecolecon.2008.01.017. A. Mestre and T. Cooper, "Circular Product Design. A Multiple Loops Life Cycle Design Approach for the Circular Economy," *Design Journal*, vol.20, pp. 1620–1635, Sep. 2017. United Nations, “Transforming our world: the 2030 Agenda for Sustainable Development,” *Resolution adopted by the General Assembly on 25 September*

	2015, A/RES/70/1, Oct, 2015.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**1.2**
	Semester:	**1**
	WHS:	**4**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**1.2 Fundamentals of Natural Science**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Prof. Dr. Kilian Smith
Dozent:in *Teaching personnel*	Prof. Dr. Johannes Radinger, Prof. Dr. Kilian Smith, Prof. Dr. Olaf Ueberschär
Sprache *Language*	English
Zuordnung zum Curriculum, Modultyp *Curriculum, Type of module*	StREaM, Compulsory module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	3 WHS Lecture 1 WHS Recitation
Arbeitsaufwand *Student workload*	150 Hrs. Total 60 Hrs. Contact time 90 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	See Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	High school-level knowledge of mathematics, physics, chemistry and general biology
Modulziele / Angestrebte Lernergebnisse *Module objectives / Learning outcomes*	**Physics** In the Physics part of the course, students will be familiarised with the basic concepts of classical physics, their underlying fundamental laws and formulations. Upon completion, students will be able to - observe, describe and understand physical phenomena und processes, especially with respect to dynamics and energy - develop quantitative descriptions and models - predict and assess system states and their development - apply and transfer gained knowledge to new problems **Introductory and environmental chemistry** The overarching goal is to embed environmental sustainability and protection as an integral concept within all other modules. Upon completion of the module the students will be able to: - apply knowledge concerning basic chemistry principles to explain and understand natural and engineered systems - demonstrate an overview of the major environmental challenges faced by communities from different parts of the world - understand the advantages and limitations of technological solutions for improving such environmental problems - possess the laboratory skills needed for performing basic

	(environmental) chemistry experiments **Biology** The objective is to provide an insight into the basics of process biology and indicator biology as a prerequisite for application in environmental restoration. Upon completion of the module, students know the main biological processes of assimilation and dissimilation. They know the main approaches of bioindication and the relevant groups of organisms.
Inhalt *Contents*	Selected fundamentals of physics, chemistry and biology that are relevant to the profile and objectives of the StREaM programme of study: **Physics** - Classical mass point kinematics and dynamics: velocity, acceleration, forces, Newtonian laws of motion, momentum and its conservation - Work and energy and their multiple forms - Multi-body systems and collisions, nuclear energy - Rigid body dynamics, torques, angular momentum and its conservation - Oscillations and mechanical waves, harmonic oscillator, damping, forced oscillations, resonance - Introduction to sound waves and acoustics - Introduction to electrodynamics and electromagnetic waves **Introductory and environmental chemistry** - Basic chemistry concepts and units; the role of atomic and molecular structure in determining material properties (gases, liquids and solids); chemical equations and reactions; thermodynamics and kinetics; acids, bases and salts; aqueous solutions and reactions - Origin and properties of constituents in aquatic systems - Environmental pollution: nutrients, anthropogenic organic contaminants, heavy metals, acid rain - Introduction to analytical chemistry (chromatography, optical and mass spectroscopy etc.) **Biology** - Assimilation (photosynthesis, chemosynthesis) - Dissimilation (respiration, fermentation) - Enzymes - Environmental microbiology - Aquatic bioindication - Laboratory work in environmental biology
Prüfungsleistungen *Type of examination*	Performance record (PR) (partial assessments)
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	**Physics** Multimedia lecture and notes as well as additional resources including computerpresentations, videos, research articles. Weekly electronic exercises with automated feedback on study progress, live experiments, repetition classes. **Introductory and environmental chemistry and Biology** Multimedia tools including computer presentations, videos etc., board, printed material, laboratory work.
Literatur *Bibliography*	**Physics** A. Serway and J. W. Jewett, *Physics for scientists and engineers*, 10th ed. Cengage learning, 2018.

	Introductory and environmental chemistry T. Brown, H. LeMay, B. Bursten, C. Murphy, P. Woodward and M. Stoltzfus, *Chemistry: The Central Science*, 14th ed. Harlow, Essex, UK: Pearsons Education Limited, 2007. Eds. R. P. Schwarzenbach, P. M. Gschwend and D. M. Imboden, *Environmental Organic Chemistry*, 3rd ed. USA: John Wiley & Sons Inc, 2016. P. L. Brezonik, W. A. A. Arnold, *Water chemistry: an introduction to the chemistry of natural and engineered aquatic*. Oxford, England: Oxford University Press, 2011. A. Manz, P. S. Dittrich, N. Pamme and D. Lossifidis, *Bioanalytical Chemistry,* 2nd ed. London, UK: Imperial College Press, 2015. **Biology** P.S. Basu, *Fundamentals of Aquatic Biology*. Lambert Academic Publishing, 2021.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**1.3**
	Semester:	**1**
	WHS:	**4**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**1.3 Mathematics 1**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Prof. Dr. Reik Donner
Dozent:in *Teaching personnel*	Prof. Dr. Reik Donner
Sprache *Language*	English
Zuordnung zum Curriculum, Modultyp *Curriculum, Type of module*	StREaM, Compulsory module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	3 WHS Lecture 1 WHS Recitation
Arbeitsaufwand *Student workload*	150 Hrs. Total 60 Hrs. Contact time 90 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	See Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	High school level knowledge of mathematics
Modulziele / Angestrebte Lernergebnisse *Module objectives / Learning outcomes*	Upon completion of the module students: - have a broad working knowledge of selected topics of calculus, linear algebra and basic financial mathematics - are able to apply a wide range of quantitative methods in the context of engineering, business and finance - recognise the usefulness of mathematics and understand mathematical concepts applied in the field of sustainability - can interpret, utilise and communicate mathematical methods in order to strengthen their arguments - are able to solve practical problems with mathematical tools independently
Inhalt *Contents*	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. Elements of financial mathematics and economic models. With practical applications throughout the entire module.
Prüfungsleistungen *Type of examination*	Performance record (PR) (partial assessments)

Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	Moodle learning platform (lecture script, exercices)
Literatur *Bibliography*	A. Croft and R. Davison, *Mathematics for Engineers*, 4th ed. London, UK: Pearson Higher Education, 2015. K. Sydsaeter, P. Hammond, A. Strom and A. Carvajal, *Essential Mathematics for Economic Analysis*, 5th ed. London, UK: Pearson Education, 2016. J. Roe, R. de Forest and S. Jamshidi, *Mathematics for Sustainability*. London, UK: Springer, 2018.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**1.4**
	Semester:	**1**
	WHS:	**4**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**1.4 Fundamentals of Economic Science**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Prof. Dr. Christian Freund
Dozent:in *Teaching personnel*	Prof. Dr. Christian Freund
Sprache *Language*	English
Zuordnung zum Curriculum, Modultyp *Curriculum, Type of module*	StREaM, Compulsory module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	3 WHS Lecture 1 WHS Recitation
Arbeitsaufwand *Student workload*	150 Hrs. Total 60 Hrs. Contact time 90 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	See Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	
Modulziele / Angestrebte Lernergebnisse *Module objectives / Learning outcomes*	Upon completion of this module, students: - have gained an overview of fundamental issues of business administration and economics and they also know the core principles of economic thinking - are able to recognise correlations between business and economics - are able to apply methods of business administration and economics to related problems - demonstrate an awareness of ethical and sustainability issues relevant to business administration and economics - are able to formulate field-related positions and discuss them critically
Inhalt *Contents*	This module familiarises students with the fundamentals of business administration and economics, including relevant disciplinary extensions with reference to sustainability. Contents are: - Introduction to microeconomics: allocation of resources to markets, competitive and monopoly markets, economic behaviour (supply and demand) - Introduction to macroeconomics: economic growth and social as well as environmental sustainability, political issues

	- Introduction to business administration: diversity of enterprises and their characteristic forms, overview of the functional theory of business administration including cross-functional relationships and sustainable business
Prüfungsleistungen *Type of examination*	Written examination, 120 min (WE120)
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	(Electronic) Literature and journals Lecture with practical applications, current case studies
Literatur *Bibliography*	N.G. Mankiw, *Principles of Economics,* Cengage Learning, 2020. H. Kopnina and J. Blewitt, *Sustainable Business: Key Issues (Key Issues in Environment and Sustainability)*, 2nd ed. Abingdon, UK; NY, USA: Routledge, 2018. S. McHugh, W.G. Nickels and J. McHugh, *Understanding Business: The Core,* 2nd ed. NY, USA: McGraw-Hill Education, 2021. Harvard Business Review. Digital Magazine (hbr.org)

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**		Module no.:	**1.5**
		Semester:	**1**
		WHS:	**3**
		Credit Points:	**5**
Modulbezeichnung *Module title*	**1.5 Intercultural Communication and Participation**		
Modulniveau *Module level*	Bachelor programme level		
Modulverantwortliche:r *Module leader*	Katja Eisenächer (M. A.)		
Dozent:in *Teaching personnel*	Katja Eisenächer (M. A.), Dr. Johanne Fischer		
Sprache *Language*	English		
Zuordnung zum Curriculum, Modultyp *Curriculum, Type of module*	StREaM, Compulsory module		
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	3 WHS Seminar		
Arbeitsaufwand *Student workload*	150 Hrs. Total 45 Hrs. Contact time 105 Hrs. Self-study		
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	See Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)		
Empfohlene Voraussetzungen *Recommended prerequisites*			
Modulziele / Angestrebte Lernergebnisse *Module objectives / Learning outcomes*	This module is designed to foster social and academic integration into the programme of study and, in a broader sense, the university and life on campus. The planned conclusion is a project week. Upon completion of this module, students will be able to: - understand and critically reflect upon different concepts and models of culture, and their relevance in personal, academic and professional contexts - develop critical cultural awareness of oneself and others - critically reflect upon intercultural interaction processes and analyse misunderstanding and conflicts - develop strategies in order to communicate effectively, one-to-one and in groups/teams, with others who have different language backgrounds and different cultural orientations/practices (including giving and receiving constructive peer feedback) - critically reflect upon their own intercultural learning processes and competence development.		
Inhalt *Contents*	Contents are, e. g. - concepts and models related to		

	▪ culture, interculturality, communication and intercultural communication ▪ diversity and intersectionality ▪ intercultural, global and democratic competence - studying and working in diverse student groups and teams including group dynamic processes, team roles and the role of culture(s) - aspects of international human resource management. The conveyed knowledge will be made tangible, applied and reflected upon by means of workshop sessions (including simulations and role-play), biography work, case studies as well as group and team work.
Prüfungsleistungen *Type of examination*	Performance record (PR) (partial assessments)
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	Interactive seminar including workshop elements, multimedia, guest lectures, group and project work as well as blended learning.
Literatur *Bibliography*	L. A. Arasaratnam-Smith, "Intercultural competence: An overview," in *Intercultural Competence in Higher Education. International Approaches, Assessment and Application,* D. K. Deardorff and L. A. Arasaratnam-Smith (Eds.), Abingdon, UK: Routledge (Taylor & Francis), 2017. U. Hoessler, W. Sponfeldner and D. L. Morse, *Project Management in International Teams*. Berlin Heidelberg, Heidelberg, Germany: Springer International Publishing, 2015. J. Flowerdew and L. Miller, "On the notion of culture in L2 lectures," *TESOL Quarterly*, vol. 29/2, pp. 345-373, 1995. J. Jackson, *The Routledge Handbook of Language and Intercultural Communication.* London, UK: Routledge,Routledge, 2020.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**1.6**
	Semester:	**1**
	WHS:	**4**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**1.6 German as a Foreign Language / Other Foreign Language (A1)**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Beatrice Schwarz-Buchholz (M. A.) (German as a Foreign Language)
Dozent:in *Teaching personnel*	Beatrice Schwarz-Buchholz (M. A.) (German as a Foreign Language) and other lecturers (Other Foreign Language)
Sprache *Language*	German / Other Foreign Language
Zuordnung zum Curriculum, Modultyp *Curriculum, Type of module*	StREaM, Compulsory module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	4 WHS Seminar
Arbeitsaufwand *Student workload*	150 Hrs. Total 60 Hrs. Contact time 90 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	See Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	
Modulziele / Angestrebte Lernergebnisse *Module objectives / Learning outcomes*	**German as a Foreign Language** Upon completion of this module, students will: - have developed speaking, listening, writing and reading skills in the German language at level A1 of the Common European Framework of Reference for Languages (CEFR) an can communicate in German according to this level - understand and can take into consideration, when communicating, aspects relating to German regional and cultural studies. **Other Foreign Language** German native speakers or students who already have the relevant German skills as defined in the Study and Examination Regulations (B2) will be required to developed comparable skills in another foreign language that is not the language of instruction (English). For information on the corresponding language offer, please contact your programme coordinator and/or director.
Inhalt	Please refer to the CEFR:

Contents	https://www.coe.int/en/web/common-european-framework-reference-languages
Prüfungsleistungen *Type of examination*	Language examination (LE) (“successfully completed” / “not successfully completed”)
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	Interactive seminar including various media, handouts, exercises, (intercultural) communication training, blended learning (using the platform Moodle). Students work individually and in groups.
Literatur *Bibliography*	Various resources (including resources available via Moodle). Literature will be announced at the beginning of the module.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**2.1**
	Semester:	**2**
	WHS:	**4**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**2.1 Materials and Production Engineering**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Prof. Dr.-Ing. Frank Trommer
Dozent:in *Teaching personnel*	Prof. Dr.-Ing. Frank Trommer, Prof. Dr.-Ing. Christian Willberg, Dr. Uta Langheinrich
Sprache *Language*	English
Zuordnung zum Curriculum, Modultyp *Curriculum, Type of module*	StREaM, Compulsory module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	3 WHS Lecture 1 WHS Recitation
Arbeitsaufwand *Student workload*	150 Hrs. Total 60 Hrs. Contact time 90 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	Module(s): 1.2 Fundamentals of Natural Science 1.3 Mathematics 1
Modulziele / Angestrebte Lernergebnisse *Module objectives / Learning outcomes*	Upon completion of this module, students will be able to: **Materials Engineering** - understand the correlation between the structure and the macroscopic behaviour of materials - evaluate and describe materials with regard to their essential mechanical, electrical and chemical properties and their possible technical applications - specify appropriate treatments to achieve desired properties **Production Engineering** - specify important manufacturing processes in the fields of primary shaping, forming, cutting and joining - characterise the process principles and derive advantages and disadvantages as well as fields of application **Process Engineering** - know unit operations and their applications in material conversion processes for chemical and environmental engineering - determine process parameters for the design and for the optimisation of devices

Inhalt *Contents*	**Materials Engineering** - Structure and basic properties of engineering materials - Phase diagramms, in particular the iron-carbon-diagramm - Methods of thermal treatment, hardening - Mechanisms of plasticity - Failure and fracture, wear - Conductor materials, semiconductors and non-conductor materials - Magnetic materials - Electrochemical behaviour of metals - Selected applications in the processing of electrical engineering materials **Production Engineering** - Introduction and overview - Casting materials, casting processes (e.g. casting in lost mold, permanent mold casting), additive manufacturing - Forming processes (e.g. rolling, forging, deep drawing, hydro-forming) - Cutting processes (e.g. turning, drilling, milling) - Joining processes (e.g. welding, brazing, mechanical joining, gluing) **Process Engineering** - Fundamentals of process engineering: mass, energy, and impulse transport Examples for: - Mechanical processes: separation processes (sieving, centrifuging, settling), combining processes (agglomerating, mixing), dividing processes (grinding, spraying) - Thermal processes: heat transfer (heating, cooling), separation of substances (crystallization, distillation) - Chemical and biological/enzymatic processes
Prüfungsleistungen *Type of examination*	Written examination, 120 min (WE120)
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	Computer presentations, video clips, sample parts
Literatur *Bibliography*	W. D. Callister and D.G. Rethwisch, *Materials Science and Engineering: An Introduction*, 8th ed. NJ, USA: John Wiley & Sons, 2010. K. Kumar, H. Kalita, D. Zindani and J.P. Davim, *Materials and Manufacturing Processes*. Berlin Heidelberg, Germany: Springer International Publishing, 2019. S. Kalpakjian and S.R. Schmid, *Manufacturing Processes for Engineering Materials*, London, UK: Pearson, 2017. L. Theodore, R.R. Dupont and K. Ganesan, *Unit operations in environmental engineering*. Hoboken NJ, USA: Scrivener Publishing Wiley, 2017.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**2.2**
	Semester:	**2**
	WHS:	**4**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**2.2 Ecology, Resources and Sustainable Cities**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Prof. Dr.-Ing. Torsten Schmidt
Dozent:in *Teaching personnel*	Prof. Dr. Johannes Radinger, Prof. Dr.-Ing. Gilian Gerke, Prof. Dr.-Ing. Torsten Schmidt, Prof. Dr.-Ing. habil. Jürgen Wiese
Sprache *Language*	English
Zuordnung zum Curriculum, Modultyp *Curriculum, Type of module*	StREaM, Compulsory module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	3 WHS Lecture 1 WHS Recitation (approx. 2 x 90 min for each of the three parts)
Arbeitsaufwand *Student workload*	150 Hrs. Total 60 Hrs. Contact time 90 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	Module(s): 1.2 Fundamentals of Natural Science
Modulziele / Angestrebte Lernergebnisse *Module objectives / Learning outcomes*	After completion of this module, students are able to: - identify natural resources (e.g. water, soil, air, raw materials) and how they are embedded in the environment (Lecture Resources) - recognise the connections and interactions between living beings and their environment and carry out a basic assessment (Lecture Ecology) - relate this knowledge to urban living spaces and evaluate possibilities of reducing anthropogenic influences on natural resources and environment with flora and fauna in cities (Lecture Sustainable Cities).
Inhalt *Contents*	**Resources** Resources form the basis for products and can be divided into primary and secondary raw materials. This part of the lecture provides an overview of these raw materials. The focus lies on secondary resources. The basis of this is understanding waste as an important resource. Students gain an essential insight into the biological, technical and organisational provision of raw materials as the foundation for a circular economy. **Ecology** In this part of the lecture, global environmental problems are examined from a biological-ecological point of view. The focus is on global material cycles,

	biodiversity and renaturation ecology. Students are familiarised with solution approaches that focus on engineering ecology. These approaches are also explained in the context of the works of the Department of Water, Environment, Construction and Safety (WUBS) and the department´s contribution to the programme of study. Recitation: Students will undertake a field trip to a selected water or wetland renaturation site, including an explanation of the measures and a demonstration of the methods of success control. **Sustainable Cities** This part of the lecture deals with sustainable concepts for handling natural resources and with the environmentally friendly planning of urban spaces. The core of this lecture are urban planning concepts that allow a sustainable use of natural resources such as water, air and soil in the urban environment. These concepts include infiltration concepts, permeable surface pavements, green roofs and facades as well as control possibilities using urban development indicators. Students are familiarised with these concepts by means of example projects that are discussed and developed further. During the recitation part of this module, selected sub-topics are discussed and worked on more in depth, including practical applications.
Prüfungsleistungen *Type of examination*	Written examination, 120 min (WE120)
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	Presentations, discussions
Literatur *Bibliography*	E. Kimberly, *Sustainable Cities: Urban Planning Challenges and Policy. USA:* Apple Academic, 2021. R. Karban, *How to Do Ecology: A Concise Handbook*, 2nd ed. NJ, USA: Princeton University Press, 2014.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**2.3**
	Semester:	**2**
	WHS:	**4**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**2.3 Mathematics 2**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Prof. Dr.-Ing. Robert Dürr
Dozent:in *Teaching personnel*	Prof. Dr.-Ing. Robert Dürr
Sprache *Language*	English
Zuordnung zum Curriculum, Modultyp *Curriculum, Type of module*	StREaM, Compulsory module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	2 WHS Lecture 2 WHS Recitation (including laboratory work)
Arbeitsaufwand *Student workload*	150 Hrs. Total 60 Hrs. Contact time 90 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	Module(s): 1.3 Mathematics 1
Modulziele / Angestrebte Lernergebnisse *Module objectives / Learning outcomes*	Upon completion of this module students: - have a broad working knowledge of selected topics of statistics and differential equations - are able to apply numerical methods and computational mathematics - are able to apply statistics and differential equations in the context of engineering, sustainability, business and finance - demonstrate the ability to analyse data and draw appropriate statistical conclusions - can communicate and critically scrutinise statistical results and their interpretations - are able to use and analyse datasets in the field of sustainability (e. g. environmental statistics)
Inhalt *Contents*	1. Mathematical operations with complex numbers 2. Ordinary differential equations 3. Statistics, probability calculus, simulation 4. Laboratory: Tools for computational mathematics (MATLAB, EXCEL, SCIP) With practical applications throughout the entire module.

Prüfungsleistungen *Type of examination*	Performance record (PR) (partial assessments)
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	Moodle learning platform: lecture script, exercises, solutions Tools for computational mathematics (MATLAB, EXCEL, SCIP)
Literatur *Bibliography*	A. Croft and R. Davison, *Mathematics for Engineers*, 4th ed. London, UK: Pearson Higher Education, 2015. J. Roe, R. de Forest and S. Jamshidi, *Mathematics for Sustainability*. London, UK: Springer, 2018. K. A. Stroud and Dexter J. Booth, *Engineering Mathematics*, 8th ed. London, UK: Red Globe Press, 2020.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**		Module no.:	**2.4**
		Semester:	**2**
		WHS:	**4**
		Credit Points:	**5**
Modulbezeichnung *Module title*	**2.4 Engineering Mechanics and Fluid Mechanics**		
Modulniveau *Module level*	Bachelor programme level		
Modulverantwortliche:r *Module leader*	N.N.		
Dozent:in *Teaching personnel*	Prof. Dr.-Ing. Daniel Bachmann, Prof. Dr.-Ing. Christian Schadow		
Sprache *Language*	English		
Zuordnung zum Curriculum *Curriculum, Type of module*	StREaM, Compulsory module		
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	2 WHS Lecture 2 WHS Recitation		
Arbeitsaufwand *Student workload*	150 Hrs. Total 60 Hrs. Contact time 90 Hrs. Self-study		
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (translation)		
Empfohlene Voraussetzungen *Recommended prerequisites*	Module(s): 1.2 Fundamentals of Natural Science 1.3 Mathematics 1 2.3 Mathematics 2 (concurrently)		
Modulziele / Angestrebte Lernergebnisse *Module objectives / Learning outcomes*	Upon successful completion of this module, students are able to: **Engineering Mechanics** - describe the relationships between force, stress, strain, and deformation in linear elastic solids under different types of loading - apply simplified mathematical models to engineering problems involving axial, shear, bending, and torsion members - effectively communicate an engineering problem solution by showing (1) the problem, (2) the convention and/or theory, (3) the method of solution, (4) the result, and (5) some sort of validation or confirmation (e. g. why do you trust your solution?) - describe traditional engineering materials and their behaviour under load and deformation - explain the premise of engineering design **Fluid Mechanics** - explain the theoretical fundamentals of hydromechanics - explain methods and approaches for solving hydromechanical problems		

	- and apply selected approaches and methods autonomously
Inhalt *Contents*	**Engineering Mechanics** Statics (fundamental principles of mechanics of rigid bodies and the application of these principles to engineering problems) - Force vectors - Equilibrium of a particle (2-D and 3-D) - Force system resultants - Equilibrium of a rigid body (2-D and 3-D) - Structural analysis (trusses and frames) - Internal forces - Gravity, centroids, and moments of inertia Strength of materials (internal stresses and deformation of structural members and machines when subjected to external forces) - Normal stresses and strains - Elasticity, plasticity, creep, Poisson's ratio - Shear stress and strain, bending stresses, design for allowable loads - Displacement of axially loaded members, statically determinate structures - Torsion, angle of twist, internal torque and deformation - Shear force and bending moment - Shear stress in beams **Fluid Mechanics** - Physical properties of fluids - Hydrostatics and buoyancy - Fundamentals of hydrodynamics - Pipe flow - Open channel flow
Prüfungsleistungen *Type of examination*	Written examination, 120 min (WE120)
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	Lecture and recitation with PowerPoint and/or on chalk board; module resources are provided digitally
Literatur *Bibliography*	R.C. Hibbeler, *Statics and Mechanics of Materials*, 5th ed. USA: Pearson, 2017. Y.A. Cengel and J.M. Cimbala, *Fluid Mechanics: Fundamentals and Applications,* 4th ed. USA: McGraw-Hill, 2019.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module No.:	**2.5**
	Semester:	**2**
	WHS:	**3**
	Credit Points:	**5**

Modulbezeichnung *Module title:*	**2.5 Scientific Project and Academic Skills**
Modulniveau *Module level:*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Prof. Dr. rer. nat. Olaf Ueberschär
Dozent:in *Teaching personnel*	Kay Bender, Dr. Johanne Fischer
Sprache *Language*	English
Zuordnung zum Curriculum *Curriculum, Type of module*	StREaM, Compulsory module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	2 WHS Lecture 1 WHS Project
Arbeitsaufwand *Student workload*	150 Hrs. Total 45 Hrs. Contact time 105 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	
Modulziele / Angestrebte Lernergebnisse *Module objectives / Learning outcomes*	Upon completion of this module students: - are able to work according to scientific methods - know the various forms of scientific literature and resources and are able to independently find, work through and correctly cite them for a given scientific problem - can conceptualise and carry out research studies on their own and present and defend their results in an adequate form - are capable of independently writing scientific papers, documents, protocols and presentations.
Inhalt *Contents*	**Lecture:** - Scientific method and research integrity - Forms of scientific literature, conducting a literature survey using a reference manager, correct citing, avoiding plagiarism - Outlining and carrying out a research/development project - Basics for writing a thesis: structure, contents, form, language, figures - Brief introduction to applied statistics for engineers and scientists - Practical exercises in a laboratory setting

	Project: - Writing a scientific report on a given problem - Working in a team: organisation, communication and meetings, logging and reporting, self-management, conflict management - Planning, implementation and documentation of experiments - Presenting study results, self-assessment
Prüfungsleistungen *Type of examination*	Performance record (PR) (partial assessments)
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	**Lecture:** Multimedia lecture notes and additional resources including presentation slides, videos, research articles. Weekly electronic exercises with automated feedback on study progress, repetition classes **Student project:** Group work
Literatur *Bibliography*	R. Murray, *How to Write a Thesis.* Maidenhead, Berkshire, UK: Open University Press, 2017. T. Deetjen, *Published: a guide to literature review, outlining, experimenting, visualization, writing, editing, and peer review for your first scientific journal article*, Productive Academic, 2020.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**2.6**
	Semester:	**2**
	WHS:	**4**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**2.6 German as a Foreign Language / Other Foreign Language (A2)**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Beatrice Schwarz-Buchholz (M. A.) (German as a Foreign Language)
Dozent:in *Teaching personnel*	Beatrice Schwarz-Buchholz (M. A.) (German as a Foreign Language) and other lecturers (Other Foreign Language)
Sprache *Language*	German / Other Foreign Language
Zuordnung zum Curriculum, Modultyp *Curriculum, Type of module*	StREaM, Compulsory module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	4 WHS Seminar
Arbeitsaufwand *Student workload*	150 Hrs. Total 60 Hrs. Contact time 90 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	See Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	
Modulziele / Angestrebte Lernergebnisse *Module objectives / Learning outcomes*	**German as a Foreign Language** Upon completion of this module, students will: - have developed speaking, listening, writing and reading skills in the German language at level A1 of the Common European Framework of Reference for Languages (CEFR) an can communicate in German according to this level - understand and can take into consideration, when communicating, aspects relating to German regional and cultural studies. **Other Foreign Language** German native speakers or students who already have the relevant German skills as defined in the Study and Examination Regulations (B2) will be required to developed comparable skills in another foreign language that is not the language of instruction (English). For information on the corresponding language offer, please contact your programme coordinator and/or director.
Inhalt	Please refer to the CEFR:

Contents	https://www.coe.int/en/web/common-european-framework-reference-languages
Prüfungsleistungen *Type of examination*	Language examination (LE) (“successfully completed” / “not successfully completed”)
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	Interactive seminar including various media, handouts, exercises, (intercultural) communication training, blended learning (using the platform Moodle). Students work individually and in groups.
Literatur *Bibliography*	Various resources (including resources available via Moodle). Literature will be announced at the beginning of the module.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**3.1**
	Semester:	**3**
	WHS:	**4**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**3.1 Renewable Energy Systems**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Prof. Dr.-Ing. Maik Koch
Dozent:in *Teaching personnel*	Prof. Dr.-Ing. Maik Koch, Prof. Dr.-Ing. Przemyslaw Komarnicki, Prof. Dr.-Ing. habil. Jürgen Wiese, Prof. Dr.-Ing. Konrad Steindorff
Sprache *Language*	English
Zuordnung zum Curriculum, Modultyp *Curriculum, Type of module*	StREaM, Compulsory module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	4 WHS Seminar-style lecture
Arbeitsaufwand *Student workload*	150 Hrs. Total 60 Hrs. Contact time 90 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	Module(s): 1.3 Mathematics 1 2.3 Mathematics 2 2.2 Ecology, Resources and Sustainable Cities
Modulziele / Angestrebte Lernergebnisse *Module objectives / Learning outcomes*	Upon completion of this module, the students: - understand and can explain principles and functionality of the generation, distribution, conversion and application of electrical and thermal energy - are able to carry out simple calculations related to electrical energy systems, e. g., energy demands - understand problems in the field of renewable energy generation, can explain approaches to solve these problems and are aware of problems that might occur during their application - are able to classify new technologies and evaluate them.
Inhalt *Contents*	- Renewable power grid components and functions - Operation of electric power grids - Challenges and solutions for the transition to carbon-free energy production - Carbon-free mobility systems for land-based vehicles (on road, off road, on track) - Visions for sustainable mobility in the future - Anaerobic treatment of organic waste - Electricity and heat generation by municipal waste incineration - Use of environmental heat

Prüfungsleistungen *Type of examination*	Written examination, 120 min (WE120) / Oral examination (OE)
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	Interactive whiteboard, videos, Moodle learning platform, computer presentations, script (digital version).
Literatur *Bibliography*	M. Kaltschmitt and W. Streicher, *Renewable Energy, Technology, Economics and Environment*. Berlin Heildelberg, Germany: Springer, 2007.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**3.2**
	Semester:	**3**
	WHS:	**4**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**3.2 International Law and Policies**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Prof. Dr. Lydia Bittner, Prof. Dr. rer. nat. Petra Schneider
Dozent:in *Teaching personnel*	Prof. Dr. Lydia Bittner, Prof. Dr. rer. nat. Petra Schneider
Sprache *Language*	English
Zuordnung zum Curriculum, Modultyp *Curriculum, Type of module*	StREaM, Compulsory module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	2 WHS Lecture 2 WHS Recitation
Arbeitsaufwand *Student workload*	150 Hrs. Total 60 Hrs. Contact time 90 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	See Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	Basic knowledge of the German or another national law system
Modulziele / Angestrebte Lernergebnisse *Module objectives / Learning outcomes*	In this module, students are familiarised with international / European law and policies related to resources and international business. As a complement to the legal situation, relevant frameworks and conventions will also be presented and discussed in this module. Upon completion of this module, students: - are familiar with bodies, international frameworks and the respective policies for the management of resources including EU, OECD and UN strategies as well as UN conventions on resource management - understand the relevant legal aspects related to resources and their management along value chains, including aspects of design, production and trade - are aware of the importance of environmentally friendly product design and its requirements as established in the EU eco-design law and other legal requirements with regard to the environment - know the fundamentals of international private law and understand which national law is applicable to contracts and commercial relations - are able to assess the advantages and disadvantages of the choice of different national law systems - know relevant international / European resource and economic policies and

	understand the consequences of these policies for a globally operating company - are able to apply the acquired knowledge, e. g. legal rules, in situations they might face in the context of their future professional activity - and are able to analyse and evaluate potential legal risks.
Inhalt *Contents*	This module is divided into three parts: 1 – Strategies and policies for sustainable resource management 2 – Fundamentals of environmental law 3 – Fundamentals of international / EU law and German federal private law **Part 1 – Strategies and policies for sustainable resource management** - Economic policies of the EU - Selected issues of international economic cooperation (in the EU and worldwide) - Relevant bodies in the field of resource management (UNEP/EC Resource Panel, IPCC, IPBES, UNRMS, UNFCCC, ICMM, EREP, etc.) - Policies for the management of biotic and abiotic resources including EU, OECD and UN strategies, TEEB study and Millennium Ecosystem Assessment - UN conventions on natural resource management; **water resources:** Ramsar convention, HELCOM, OSPAR, transboundary watercourse convention, convention on law of the sea, non-navigational use of international watercourses; **biotic resources:** biodiversity convention, international trade of endangered species; **atmosphere:** climate change, protection of the ozone layer; **land:** LULUCF; **waste:** Basel convention, - Organisation for Economic Co-operation and Development (OECD): global material resources outlook, recommendation on material flows and resource productivity, policy guidance on resource efficiency - International raw materials agreements to ensure supply chains - Key issues on the non-conflictual use of resources, particularly transboundary resources - Principles of good governance (government and company level) **Part 2 – Fundamentals of environmental law** - EU Policies and their Transition into National Law - Corporate Social Responsibility (CSR) - Energy – Power Generation from Renewable Energy Resources - Climate Protection Law, Eco-Design - Labour Protection (incl. Minimum Wages), Occupational Health and Safety **Part 3 – Fundamentals of international / EU and German federal private law** This part of the module familiarises students with selected areas of international / EU and German federal private law, including commercial law, that are important for working in a globally operating company: - International / EU and German Privat Law - Negotiation and Drafting of international Contracts - Product liability
Prüfungsleistungen *Type of examination*	Written examination, 120 min (WE120) / Term paper (TP)

Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	Lecture with recitation (exercises, case studies), discussions
Literatur *Bibliography*	A. Orsini und E. Kavvatha, *EU Environmental Governance: Current and Future Challenges*. NY, USA: Routledge, 2020. P. Sukhdev, H. Wittmer, C. Schröter-Schlaack, C. Nesshöver, J. Bishop, P. Brink, H. Gundimeda, P. Kumar and B. Simmons, *The Economics of Ecosystems and Biodiversity: Mainstreaming the Economics of Nature: A Synthesis of the Approach, Conclusions and Recommendations of TEEB,* TEEB, 2010. http://teebweb.org/publications/teeb-for/synthesis/ M. Dixon, R. Mc. Corquodale and S. Williams, *Cases & Materials on International Law,* 6th ed. NY, USA: Oxford University Press, 2016. P. Krugman, M. Obstfeld and M. Melitz, *International Economics: Theory and Policy,* 10th ed. NJ, USA: Prentice Hall, 2014. R. Baldwin, C. Wyplosz, *The Economics of European Integration*, 5th ed. NY, USA: Mcgraw-Hill Education Ltd, 2015. C. Bernard, *The Substantive Law of the EU: The Four Freedoms*, 6th ed. NY, USA: Oxford University Press, 2019.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**3.3**
	Semester:	**3**
	WHS:	**4**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**3.3 Information Technology and Data Science**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Prof. Dr.-Ing. Sebastian von Enzberg
Dozent:in *Teaching personnel*	Prof. Dr.-Ing. Sebastian von Enzberg
Sprache *Language*	English
Zuordnung zum Curriculum, Modultyp *Curriculum, Type of module*	StREaM, Compulsory module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	2 WHS Lecture 2 WHS Recitation
Arbeitsaufwand *Student workload*	150 Hrs. Total 60 Hrs. Contact time 90 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	See Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	Module(s): 1.3 Mathematics 1 1.4 Fundamentals of Economic Science 2.3 Mathematics 2
Modulziele / Angestrebte Lernergebnisse *Module objectives / Learning outcomes*	In this module, theories and concepts related to the realisation of information systems are taught and applied using relational databases. The module includes the fundamentals of Structured Query Language (SQL) and database design for modeling, storing and retrieving business-relevant data. It also introduces concepts of Data Sciene using Python and Jupyter Notebooks for processing and analyzing structured data. Upon completion of this module, students are able to: - structure and manage large amounts of data and mine knowledge from them - understand theories of relational databases and can apply them in the context of business information technology systems - model systems and processes from the perspective of business informatics issues, with a focus on the data-oriented implementation of business information systems - use data-driven modelling as a core competence for mastering business and information technology systems - identify and select proper computational analysis techniques for different types of data analysis problems.

Inhalt *Contents*	- Topics, fields of work and methods of business informatics - Information, data, codes - Databases and modelling - Data-oriented modelling using the Entity Relationship Model (ERM) and Unified Modeling Language (UML) diagrams - Systems and models of business information systems - Data modelling, functional modelling, organisational modelling - Normalisation of data tables - Database operations, SQL - Case study on data-oriented modelling using the ERM - Database design phases - Rules of formal database design - The relational database model - Properties of relations - Big data analytics and data mining: regression and classification problems, overview on corresponding analysis methods
Prüfungsleistungen *Type of examination*	Performance record (PR) (partial assessments) / Oral examination (OE) / Portfolio (Po)
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	Workstations in computer lab. Blackboard, projector, video material, Moodle learning platform (including accompanying documents), web tests, exercises.
Literatur *Bibliography*	R. Elmasri, S. B. Navathe, *Fundamentals of Database Systems*, 7th ed. NJ, USA: Prentice Hall, 2016. A. G. Taylor, *SQL: All-In-One For Dummies*, 9th ed. Germany: Wiley-VCH, 2019. T. A. Runkler, *Data Analytics: Models and Algorithms for Intelligent Data Analysis. Germany: Springer Vieweg*, 2020. V. Kotu, *Data Science: Concepts and Practice. USA: Morgan Kaufmann*, 2018.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**3.4**
	Semester:	**3**
	WHS:	**4**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**3.4 Machine Design**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	N.N.
Dozent:in *Teaching personnel*	Prof. Dr.-Ing. Christian Willberg, Michael Robra (M. Sc.)
Sprache *Language*	English
Zuordnung zum Curriculum, Modultyp *Curriculum, Type of module*	StREaM, Compulsory module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	2 WHS Lecture 2 WHS Recitation
Arbeitsaufwand *Student workload*	150 Hrs. Total 60 Hrs. Contact time 90 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	See Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	Module(s): 2.4 Engineering Mechanics and Fluid Mechanics 2.5 Scientific Project and Academic Skills
Modulziele / Angestrebte Lernergebnisse *Module objectives / Learning outcomes*	Upon completion of this module, students are able to: - apply the concepts of statics and strength of materials in the design of common machine elements with regards to preventing failure from both static and dynamic loading - utilise modern CAD software to produce drawings for engineering applications - solve simple open-ended design problems utilising methodical design methods.
Inhalt *Contents*	The module is divided in two parts: **Theoretical part** - Machine elements, e. g. shafts, bearings, gears, clutches/brakes, fasteners - Methodical design, e. g. product development process, VDI 2221, 2206 - Computer-aided design (CAD): usage of CATIA V5, graphical usage interface, main functionalities. **Practical part** Application of the conveyed knowledge within the framework of a technical design project including calculation and drawing.

Prüfungsleistungen *Type of examination*	Term paper (TP), Presentation (Pre)
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	Computer presentations, videos, black- and interactive whiteboard. Software: CATIA V5. Resources are available on the Moodle learning platform.
Literatur *Bibliography*	S. M. Metwalli, Machine Design with CAD and Optimization, 1th ed. NJ, USA: John Wiley & Sons P&T, 2021. Daizhong Su, Sustainable Product Development - Tools, Methods and Examples. Germany: Springer Cham, 2020. M. Sorli and D.Stokic, *Innovating in Product/Process Development: Gaining Pace in New Product Development*. London, UK: Springer London, 2009. S. Schmid, B.J. Hamrock and Bo O. Jacobson, *Fundamentals of Machine Elements*. USA: CRC Press, 2014. Mott, R., *Machine Elements in Mechanical Design.* London, UK: Pearson, 2018.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**3.5**
	Semester:	**3**
	WHS:	**4**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**3.5 Sustainable Production Management and Global Supply Chains**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Prof. Dr.-Ing. Fabian Behrendt
Dozent:in *Teaching personnel*	Prof. Dr.-Ing. Fabian Behrendt and other lecturers
Sprache *Language*	English
Zuordnung zum Curriculum, Modultyp *Curriculum, Type of module*	StREaM, Compulsory module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	4 WHS Seminar-style lecture
Arbeitsaufwand *Student workload*	150 Hrs. Total 60 Hrs. Contact time 90 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	See Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	Module(s): 1.1 Sustainable Development (Interdisciplinary Introduction) 1.4 Fundamentals of Economic Science 1.6, 2.6, 3.6 German as a Foreign Language (the latter concurrently)
Modulziele / Angestrebte Lernergebnisse *Module objectives / Learning outcomes*	Upon completion of this module, students: - have acquired the conceptual and theoretical foundations of the operational functions in the subject areas of logistics, supply chain management and production management - understand goals, tasks and strategies of these functional areas - have acquired basic knowledge with regard to production systems, production factors and organisations - know the interrelationships between the levels and sublevels of production planning and control - are able to identify sustainability aspects related to logistical and production systems and are able to adapt them to practical contexts - know application-oriented methods, instruments and problem-solving techniques that exist in the mentioned areas in order to deal with practical issues, especially against the background of a stronger consideration of sustainability aspects such as reducing transport routes and overcapacities or establishing circular economy approaches - are able to apply the imparted knowledge while working on use cases - are able to reflect upon their learning progress.

Inhalt *Contents*	This module addresses the basics of logistics, supply chain management and production management. This includes: - Fundamentals, objectives and tasks of process-oriented logistics (procurement, production, distribution and return logistics, circular economy) and of higher-level supply chain management - Methods and strategies of inventory and warehouse planning - Fundamentals, goals and tasks of strategic, tactical and operative production management - Determination of demand, supplier management and order quantity planning in the context of production based and practice-oriented use cases and business games, with a special focus on sustainability. The course content is taught holistically through the use of practical case studies and business games with a strong focus on sustainability and the circular economy (e. g. business game "The Blue Connection"). Particular emphasis is placed on raising awareness for sustainability aspects (CO_2 footprint, aspects linked to global supply chains) and on how to communicate them.
Prüfungsleistungen *Type of examination*	Written examination, 90 min (WE90) / Disquisition (D)
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	BYOD concept (bring your own device). Computer presentations, tools for online collaboration, haptic and/or digital serious games, use cases, audio and/or video clips. Individual and group work.
Literatur *Bibliography*	J. Sarkis, *Greening the Supply Chain*. Berlin Heidelberg, Germany: Springer International Publishing, 2006. D. Weenk, R. Henzen, *Mastering the Circular Economy.* London, UK: Kogan Page Ltd, 2021. C. Achillas, D. D. Bochtis, D. Aidonis, D. Folinas, *Green Supply Chain Management,* London, UK: Taylor & Francis Ltd, 2019.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**3.6**
	Semester:	**3**
	WHS:	**4**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**3.6 German as a Foreign Language / Other Foreign Language (B1)**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Beatrice Schwarz-Buchholz (M. A.) (German as a Foreign Language)
Dozent:in *Teaching personnel*	Beatrice Schwarz-Buchholz (M. A.) (German as a Foreign Language) and other lecturers (Other Foreign Language)
Sprache *Language*	German / Other Foreign Language
Zuordnung zum Curriculum, Modultyp *Curriculum, Type of module*	StREaM, Compulsory module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	4 WHS Seminar
Arbeitsaufwand *Student workload*	150 Hrs. Total 60 Hrs. Contact time 90 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	See Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	
Modulziele / Angestrebte Lernergebnisse *Module objectives / Learning outcomes*	**German as a Foreign Language** Upon completion of this module, students will: - have developed speaking, listening, writing and reading skills in the German language at level A1 of the Common European Framework of Reference for Languages (CEFR) an can communicate in German according to this level - understand and can take into consideration, when communicating, aspects relating to German regional and cultural studies. **Other Foreign Language** German native speakers or students who already have the relevant German skills as defined in the Study and Examination Regulations (B2) will be required to developed comparable skills in another foreign language that is not the language of instruction (English). For information on the corresponding language offer, please contact your programme coordinator and/or director.
Inhalt	Please refer to the CEFR:

Contents	https://www.coe.int/en/web/common-european-framework-reference-languages
Prüfungsleistungen *Type of examination*	Language examination (LE) (“successfully completed” / “not successfully completed”)
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	Interactive seminar including various media, handouts, exercises, (intercultural) communication training, blended learning (using the platform Moodle). Students work individually and in groups.
Literatur *Bibliography*	Various resources (including resources available via Moodle). Literature will be announced at the beginning of the module.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**4.1**
	Semester:	**4**
	WHS:	**3**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**4.1 Sustainability Management**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Prof. Dr. Harald Apel
Dozent:in *Teaching personnel*	Prof. Dr. Christian Freund, Prof. Dr. rer. nat. Petra Schneider
Sprache *Language*	English
Zuordnung zum Curriculum, Modultyp *Curriculum, Type of module*	StREaM, Compulsory module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	2 WHS Lecture 1 WHS Project
Arbeitsaufwand *Student workload*	150 Hrs. Total 45 Hrs. Contact time 105 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	Module(s): 1.1 Sustainable Development (Interdisciplinary Introduction) 2.2 Ecology, Resources and Sustainable Cities
Modulziele / angestrebte Lernergebnisse *Module objectives / Learning outcomes*	Upon completion of this module, students are able to: - impart and apply basic knowledge of sustainability management, especially in the areas of environmental management, occupational health and safety management and quality management systems, as well as basic knowledge of corporate social responsibility approaches - demonstrate an awareness of the range of professional, ethical and legal issues relevant to their disciplines and to their future professional environment - plan, control and implement application-oriented sustainability management projects - analyse international requirements that are essential to the introduction of management systems as stated above, and are able to put these requirements into practice
Inhalt *Contents*	- Fundamentals of management systems and sustainability management as well as companies´ needs thereof - Value chains and material life cycle - Overview of methods of environmental assessment: environmental impact assessment, life cycle assessment, environmental accounting, - Eco-efficiency analysis, fundamentals of industrial ecology - Integrated management systems

	- Environmental management (ISO 14001, EMAS, low level systems) - Social impact assessment and social responsibility - Occupational health and safety management (ISO 45001) - Guality management systems (ISO 9001) - Global Reporting Initiative and Corporate Social Responsibility - Sustainability management according to ISO 26000 - Environmentally-oriented corporate management
Prüfungsleistungen *Type of examination*	Term paper (TP), Presentation (Pre)
Medieneinsatz, Arbeitsformen *Use of media, Forms of work*	Lecture with computer presentations, exercices, discussions; project work based on practical examples and case studies
Literatur *Bibliography*	J.R. Ehrenfeld, “Eco-efficiency: Philosophy, theory and tools”, *Journal of Industrial Ecology,* vol. 9 (4): 6–8, 2005, doi:10.1162/108819805775248070. N. Guenster, R. Bauer, J. Derwall and K. Koedijk, "The economic value of corporate eco-efficiency", *European Financial Management,* vol. 17 (4), pp. 679–704, 2011. R. Hahn, "Standardizing Social Responsibility? New Perspectives on Guidance Documents and Management System Standards for Sustainable Development", *IEEE - Transactions on Engineering Management,* vol. 9 (4), Nov. 2012, doi:10.1109/TEM.2012.2183639. M. Z Hauschild, R.K. Rosenbaum, S.I. Olsen, *Life Cycle Assessment: Theory and Practice*. Cham, Switzerland: Springer International Publishing, 2018. G. Huppes and I. Mansanobu, *Quantified eco-efficiency: An introduction with applications.* London, UK: Springer London, 2007. B.Sheehy, "Defining CSR: Problems and Solutions", *Journal of Business Ethics,* vol. 131(3), pp. 625-648, Jan. 2015, doi:10.1007/s10551-014-2281-x. Standards by the International Organization for Standardization: www.iso.org ISO 9000 - Quality management, in particular 9001 ISO 14000 family - Environmental management, in particular 14001, 14040, 14044 ISO 26000:2010 Guidance on social responsibility ISO 45000 - Occupational Safety Management, in particular 45001

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**4.2**
	Semester:	**4**
	WHS:	**3**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**4.2 Ethics and Social Responsibility**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Prof. Dr. Gretchen Schaupp
Dozent:in *Teaching personnel*	Prof. Dr. Gretchen Schaupp and other lecturers
Sprache *Language*	English
Zuordnung zum Curriculum, Modultyp *Curriculum, Type of module*	StREaM, Compulsory module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	2 WHS Lecture 1 WHS Project
Arbeitsaufwand *Student workload*	150 Hrs. Total 45 Hrs. Contact time 105 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	Openness to different perspectives; enjoyment of critical, constructive reflection
Modulziele / angestrebte Lernergebnisse *Module objectives / Learning outcomes*	The focus of this module is on essential concepts and problems of economic and corporate ethics as well as on ethical principles in engineering and the social responsibility of engineers. Upon completion of the module, the students: - are able to explain essential concepts and problems of business ethics as well as sustainable management and are able to reflect upon them critically - are able to describe the different, partly competing goals of companies and relate them to one another in a balanced way - are able to develop solutions to practical challenges of business ethics, especially in the context of globally operating companies and value chains - are able to analyse current guiding principles and develop concrete proposals for improvement - know and take into account the ethical responsibilities of engineers in light of new challenges, in the field of sustainability but also in other fields* - are aware of potential responsibility conflicts and are able to evaluate them* - are aware of the possible consequences of their professional work as engineers and are able to critically reflect upon them* - are aware that technical systems do not function detached from ecology, economy and society and are able to critically reflect upon the impact of these systems on future generations* - have developed competencies that are needed in order to act in an ethical

	and responsible way, as professionals and as members of society, and are able to expand these competencies* * cf. in German: www.vdi.de/ethischegrundsätze (2021)
Inhalt *Contents*	- Sustainability as a business principle - Corporate social responsibility, sustainability and compliance - Overview of classic and modern approaches to business and corporate ethics - Shareholder management vs. stakeholder management - Ethical leadership as a modern management principle - Corporate culture and mission statements - Ethical principles and the social responsibility of engineers - Competing goals of companies - Responsibility conflicts - Error culture and error management
Prüfungsleistungen *Type of examination*	Disquisition (D) / Oral examination (OE) / Term paper (TP)
Medieneinsatz, Arbeitsformen *Use of media, Forms of work*	Lecture including exercises, case studies, discussions, guest talks, group and project work
Literatur *Bibliography*	S. Brunelli, E. D. Carlo, *Accountability, Ethics and Sustainability of Organizations.* Cham, Switzerland: Springer International Publishing, 2020. F.F. Schweigert, “Social Responsibility as a Matter of Justice: A Proposal to expand Business Ethics Education” in *Business Ethics Education and the Pragmatic Pursuit of the Good.* Cham, Switzerland: Springer International Publishing, 2016. R. Meinhold, *Business Ethics and Sustainability*. NY, USA: Routledge, 2022. A.R. Bielefeldt, “Professional Social Responsibility in Engineering” in *Social Responsibility,* I.Muensterman. IntechOpen, 2018. Verein Deutscher Ingenieure (VDI) e. V. (2021). Ethische Grundsätze des Ingenieurberufs.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**4.3**
	Semester:	**4**
	WHS:	**4**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**4.3 Business Development, Innovation Management and Marketing**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Prof. Dr. Torsten Heitjans
Dozent:in *Teaching personnel*	Prof. Dr. Torsten Heitjans
Sprache *Language*	English
Zuordnung zum Curriculum *Curriculum, Type of module*	StREaM, Compulsory module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	2 WHS Lecture 2 WHS Project
Arbeitsaufwand *Student workload*	150 Hrs. Total 60 Hrs. Contact time 90 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	
Empfohlene Voraussetzungen *Recommended prerequisites*	Module(s): 1.1 Sustainable Development (Interdisciplinary Introduction) 1.4 Fundamentals of Economic Science
Modulziele / angestrebte Lernergebnisse *Module objectives / Learning outcomes*	Upon completion of this module, students will be able to: - generate sustainable, innovative business ideas (ideation) and evaluate them (e. g. with regard to marketability and feasibility) - develop project-based business models (business model development) and demonstrate the first steps of business model implementation - analyse central aspects of market-oriented (innovation) management - understand how marketing increases the likelihood of successful market introduction (and diffusion) of innovative products.
Inhalt *Contents*	- The concept of the business model and the importance of business model innovation - The strategic context of business model development - Identification and development of business model innovations - “Business Model Canvas”: representation, analysis and development of business models - Business model assessment and agile development with the lean start-up approach - Elevator pitch - First steps of the business model implementation

	- Central aspects of market-oriented management - Strategic concepts, relevant methods and instruments in the innovation process and in the marketing of innovations.
Prüfungsleistungen *Type of examination*	Project report (Pro), Presentation (Pre)
Medieneinsatz und Arbeitsformen *Use of media, Forms of work*	Group work, project work, pitch
Literatur *Bibliography*	K. Goffin, R. Mitchell, *Innovation Management. Effective Strategy and Implementation*. London, UK: Red Globe Press, 2016. A. Osterwalder, Y. Pigneur, *Business Model Generation. A Handbook for Visionaries, Game Changers, and Challengers.* NJ, USA: John Wiley & Sons, 2010. A. Osterwalder, Y. Pigneur and G. Bernarda, *Value Proposition Design: How to Create Products and Services Customers Want (Strategyzer)*. NJ, USA: John Wiley & Sons, 2014. P. Kotler, G. Armstrong, *Principles of Marketing*. London, UK: Pearson, 2019. E. Ries, *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses*. NY, USA: Crown Business, 2017.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**4.4**
	Semester:	**4**
	WHS:	**4**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**4.4 International Accounting and Finance**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Prof. Dr. Jonas Schäuble
Dozent:in *Teaching personnel*	Prof. Dr. Jonas Schäuble
Sprache *Language*	English
Zuordnung zum Curriculum *Curriculum, Type of module*	StREaM, Compulsory module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	3 WHS Lecture 1 WHS Recitation
Arbeitsaufwand *Student workload*	150 Hrs. Total 60 Std. Contact time 90 Std. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	Module(s): 1.4 Fundamentals of Economic Science 3.2 International Law and Policies 1.3 Mathematics 1 2.3 Mathematics 2
Modulziele / angestrebte Lernergebnisse *Module objectives / Learning outcomes*	This module is divided into two parts. The part on International Accounting is intended to measure and report the financial positions and the financial performance of an organization. The part dealing with Finance provides an introduction to the basic principles of corporate finance from the perspective of financial managers who are responsible for making significant investment and financing decisions. Upon completion of this module, in the field of **International Accounting**, students: - understand why companies keep accounts and publish (consolidated) financial statements - understand the main principles and rules of national and international accounting standards as well as accounting proceedings, techniques, and concepts - know how business transactions are represented in the (consolidated) financial statements and are able to prepare the (consolidated) financial statement of a company in a simplified form - know how to deal with certain accounting issues and how to depict their consequences in the (consolidated) financial statement

	- know how the financial position and the financial performance of an organisation is measured and reported - are familiar with the basics of sustainability accounting/reporting and know about the current debate in this field Upon completion of this module, in the field of **Finance**, students - have gained a basic understanding of the importance of financial decision making and the respective financial models - understand the theory of corporate finance - understand the different types of funding and financing instruments - are able to determine the specific financing needs of an organisation, the objective being to secure the financial balance and to minimise the cost of financing - know about the current debate in the field of (sustainable) corporate finance and are able to reflect critically upon issues related to this debate.
Inhalt *Contents*	**International Accounting** - International and international regulations of accounting - International Financial Reporting Standards (IFRS) - Measuring and reporting the financial position of an organization - Measuring and reporting the financial performance of an organization - Preparation and interpretation of financial statements - Analysis and interpretation of financial accounting information - Accounting proceedings and accounting techniques - Basic issues relating to group accounting - Basic issues relating to sustainability accounting/reporting **Finance** - Theory and concept of investment and financing - Basic methods for optimal decision making (static and dynamic investment calculation), also under the presence of economic uncertainty - The role of banks and financial institutions - The concept of time value of money - Sources of capital (equity, debt, mezzanine, alternatives) - Basis issues relating to insolvency proceedings - Basic issues relating to sustainable corporate finance
Prüfungsleistungen *Type of examination*	Written examination, 120 min (WE120)
Medieneinsatz und Arbeitsformen *Use of media, Forms of work*	Besides conveying basic theoretical knowledge, this module includes examples and case studies that are discussed and worked on interactively, through exchanges with the lecturer and between students. The lecture includes media-supported presentations as well as contributions from (external) lecturers.
Literatur *Bibliography*	R. A. Brealey, S. C. Myers and F. Allen, *Principles of Corporate Finance*, 12th ed. India: McGraw-Hill Education, 2018. J. J. Weygandt, P. D. Kimmel and D. E. Kieso, *Accounting Principles*, 12th ed. NJ, USA: John Wiley & Sons Inc., 2015. S. H. Penman, *Financial Statement Analysis and Security Valuation*, 5th ed., Europe: McGraw-Hill Education, 2012.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**4.5**
	Semester:	**4**
	WHS:	**4**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**4.5 Product Development and Production Processes**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Prof. Dr.-Ing. Gilian Gerke
Dozent:in *Teaching personnel*	Prof. Dr.-Ing. Gilian Gerke, Prof. Dr.-Ing. Benedikt Lamontain
Sprache *Language*	English
Curriculum, Modultyp *Curriculum, Type of module*	StREaM, Compulsory module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	1 WHS Lecture 2 WHS Project
Arbeitsaufwand *Student workload*	150 Hrs. Total 45 Hrs. Contact time 105 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	Module(s): 1.1 Sustainable Development (Interdisciplinary Introduction) 2.1 Materials and Production Engineering 2.2 Ecology, Resources and Sustainable Cities 2.5 Scientific Project and Academic Skills 3.4 Machine Design 3.5 Production Management and Global Supply Chains
Modulziele / angestrebte Lernergebnisse *Module objectives / Learning outcomes*	The objective of this module is to familiarise students with the fundamentals of product development and production processes, with a special focus on sustainability and recyclability, through problem-based teaching and learning and by means of a self-managed student project the objective of which is to realise a sustainable product. Upon completion of this module, students: - understand the process chain from the development of a product to its production and use (cradle to end-of-life) - understand and are able to carry out an ecological monitoring of a product alongside its value chain, aiming at identifying and reducing the product´s global warming potential - are able to redesign a product according to sustainable goals, while taking into account material and energy specific issues - are able to establish a project plan with a given budget and time frame - are able to manage their project as well as carry out their project tasks autonomously, advised by their lecturers if necessary.

Inhalt *Contents*	This module is divided into two parts. **Theoretical part (fundamentals)** - Product development: development methods, product development process, virtual product development - Production processes: ecological monitoring, recycling technologies **Practical part (project)** Application of the conveyed knowledge within the framework of a technical design project (if possible, in cooperation with an industrial partner). Additionally, there will be field trips to industrial partners.
Prüfungsleistungen *Type of examination*	Project report (Pro), Presentation (Pre)
Medieneinsatz und Arbeitsformen *Use of media, Forms of work*	Computer presentations, group and project work including creative techniques
Literatur *Bibliography*	W. Klöpffer, B. Grahl, *Life Cycle Assessment (LCA): a Guide to best practice*, Weinheim Germany: Wiley-VCH, 2014. N. Niessner, *Recycling of Plastics*, München, Germany: Carl Hanser Verlag GmbH & Co. KG, 2022. D. Schönmayr*, Automotive Recycling, Plastics and Sustainability.* Cham, Switzerland: Springer International Publishing*, 2017.* A. Cullen, Material Recycling Handbook, NY, USA: NY Research Press, 2015. C. A. Mattson, C. D. Sorensen, *Product Development – Principles and Tools for Creating Desireable and Transferable Designs*. Cham, Switzerland: Springer International Publishing, 2020. A. Bernard, *Global Product Development – Proceedings of the 20th CIRP Design Conference, Ecole Centrale de Nantes, Nantes, France, 19th-21st April 2010.* Berlin Heidelberg, Germany: Springer International Publishing, 2011.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**4.6**
	Semester:	**4**
	WHS:	**4**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**4.6 German as a Foreign Language / Other Foreign Language (B2)**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Beatrice Schwarz-Buchholz (M. A.) (German as a Foreign Language)
Dozent:in *Teaching personnel*	Beatrice Schwarz-Buchholz (M. A.) (German as a Foreign Language) and other lecturers (Other Foreign Language)
Sprache *Language*	German / Other Foreign Language
Zuordnung zum Curriculum, Modultyp *Curriculum, Type of module*	StREaM, Compulsory module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	4 WHS Seminar
Arbeitsaufwand *Student workload*	150 Hrs. Total 60 Hrs. Contact time 90 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	See Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	
Modulziele / Angestrebte Lernergebnisse *Module objectives / Learning outcomes*	**German as a Foreign Language** Upon completion of this module, students will: - have developed speaking, listening, writing and reading skills in the German language at level A1 of the Common European Framework of Reference for Languages (CEFR) an can communicate in German according to this level - understand and can take into consideration, when communicating, aspects relating to German regional and cultural studies. **Other Foreign Language** German native speakers or students who already have the relevant German skills as defined in the Study and Examination Regulations (B2) will be required to developed comparable skills in another foreign language that is not the language of instruction (English). For information on the corresponding language offer, please contact your coordinator and/or director.
Inhalt	Please refer to the CEFR:

Contents	https://www.coe.int/en/web/common-european-framework-reference-languages
Prüfungsleistungen *Type of examination*	Language examination (LE) (“successfully completed” / “not successfully completed”)
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	Interactive seminar including various media, handouts, exercises, (intercultural) communication training, blended learning (using the platform Moodle). Students work individually and in groups.
Literatur *Bibliography*	Various resources (including resources available via Moodle). Literature will be announced at the beginning of the module.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**5.1**
	Semester:	**5**
	WHS:	**2-4**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**5.1 Compulsory elective module (see Appendix 1)**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	See Appendix 1
Dozent:in *Teaching personnel*	See Appendix 1
Sprache *Language*	English / German
Zuordnung zum Curriculum, Modultyp *Curriculum, Type of module*	StREaM, Compulsory elective module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	2-4 WHS
Arbeitsaufwand *Student workload*	150 Hrs. Total 30-60 Hrs. Contact time 120-90 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	See Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	Depending on Compulsory elective module
Modulziele / Angestrebte Lernergebnisse *Module objectives / Learning outcomes*	Depending on Compulsory elective module
Inhalt *Contents*	Depending on Compulsory elective module
Prüfungsleistungen *Type of examination*	Depending on Compulsory elective module
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	Depending on Compulsory elective module
Literatur *Bibliography*	Depending on Compulsory elective module

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**5.2**
	Semester:	**5**
	WHS:	**2-4**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**5.2 Compulsory elective module (see Appendix 1)**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	See Appendix 1
Dozent:in *Teaching personnel*	See Appendix 1
Sprache *Language*	English / German
Zuordnung zum Curriculum, Modultyp *Curriculum, Type of module*	StREaM, Compulsory elective module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	2-4 WHS
Arbeitsaufwand *Student workload*	150 Hrs. Total 30-60 Hrs. Contact time 120-90 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	See Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	Depending on Compulsory elective module
Modulziele / Angestrebte Lernergebnisse *Module objectives / Learning outcomes*	Depending on Compulsory elective module
Inhalt *Contents*	Depending on Compulsory elective module
Prüfungsleistungen *Type of examination*	Depending on Compulsory elective module
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	Depending on Compulsory elective module
Literatur *Bibliography*	Depending on Compulsory elective module

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**5.3**
	Semester:	**5**
	WHS:	**4**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**5.3 Team Development and Leadership**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Prof. Dr. Gretchen Schaupp
Dozent:in *Teaching personnel*	Prof. Dr. Gretchen Schaupp and other lecturers
Sprache *Language*	English
Curriculum, Modultyp *Curriculum, Type of module*	StREaM, Compulsory module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	3 WHS Lecture 1 WHS Recitation
Arbeitsaufwand *Student workload*	150 Hrs. Total 60 Hrs. Contact time 90 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	Module(s): 1.5 Intercultural Communication and Participation 2.5 Scientific Project and Academic Skills 4.1 Sustainability Management 5.4 Controlling and Project Management (concurrently) 5.5 Interdisciplinary Project (concurrently)
Modulziele / angestrebte Lernergebnisse *Module objectives / Learning Outcomes*	The objective of this module is to familiarise students with the essentials of leadership, in society and at work, and with the development of teams. It includes issues such as leadership styles, employee and team management, especially the management of intercultural and virtual teams, as well as management in the context of change. Upon completion of this module, students will: - understand the central importance of leadership in business and society, starting with oneself (self-leadership) - know different leadership approaches, their objectives and the contexts in which they are used - know essential management principles and can evaluate them in a leadership context - have an overview of relevant management functions (please see Contents section) and know about prerequisites and difficulties in these areas - know the essentials of team management and team development - understand the potential benefits and risks of working in and managing interdisciplinary, intercultural and virtual teams

	- know the key concepts of management in the context of change - be able to critically reflect upon their own ideas of leadership and management as well as on the contents of the module - be able to critically reflect upon their situation in their own teams in project modules (burdens, limits, conflicts, self-imposed vs. external learning outcomes, consequences for their work processes) - be able to strengthen and further develop their self-competence.
Inhalt *Contents*	- Leadership in society and at work - Leadership vs. management - Development, theory and practice of management - Traditional and current management models and concepts - Typical misconceptions and errors in management - Basic management principles and their practical relevance - Management functions: agreeing on goals, organising, making decisions, controlling, promoting employees - Developing and managing interdisciplinary, intercultural and virtual teams - Leadership and management in the context of change - Reflection
Prüfungsleistungen *Type of examination*	Oral examination (OE) / Disquisition (D)
Medieneinsatz und Arbeitsformen *Use of media, Forms of work*	Lecture including exercises, case studies and discussions
Literatur *Bibliography*	U. Hoessler, W. Sponfeldner and D. L. Morse, “Project Management in International Teams*”* in *Applied Psychology for Project Managers: A Practitioner's Guide to Successful Project Management,* M. Wastian, 2015. L. Rosenstiel, M. A. West and I. Braumandl. Berlin Heidelberg, Germany: Springer International Publishing, pp. 287-304, 2015.. S.P. Robbins, M.A. Coulter and D.A. De Cenzo, *Fundamentals of Management: Essential Concepts and Applications*, 11th ed. Harlow, UK: Pearson Education Limited, 2019. K. N. Tang, *Leadership and Change Management*. Singapore: Springer, 2019.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**5.4**
	Semester	**5**
	WHS:	**4**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**5.4 Controlling and Project Management**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Prof. Dr. Jens-Martin Loebel
Dozent:in *Teaching personnel*	Prof. Dr. Thomas Nellessen
Sprache *Language*	English
Curriculum, Modultyp *Curriculum, Type of module*	StREaM, Compulsory module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	3 WHS Lecture 1 WHS Project
Arbeitsaufwand *Student workload*	150 Hrs. Total 60 Hrs. Contact time 90 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	Module(s): 1.3 Mathematics 1 1.4 Fundamentals of Economic Science 2.3 Mathematics 2 3.2 International Law and Policies 4.4 International Accounting and Finance
Modulziele / angestrebte Lernergebnisse *Module objectives / Learning Outcomes*	This module is divided into two parts, Controlling and Project Management. **Controlling:** This part is intended to introduce students to strategic and operational 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). Upon completion of the module, students: - understand value-oriented performance measurement systems and are able to calculate and to critically analyse them - understand the conceptual basics of different instruments that are regularly used in corporate controlling - are able to apply these instruments to concrete examples by means of exercises and case studies - can independently develop, apply and critically question solutions for controlling-specific problems - understand how controlling can contribute to substantiating business management decisions - are familiar with instruments and methods with which corporate sustainability strategies can be implemented and their results can be measured,

	documented and communicated. **Project Management:** This part provides an introduction to sustainable project management methods, reoccurring project phases, and different forms of project organisation. Upon completion of the module, students: - understand and know how to use different techniques of project planning and management with a special focus on collaborative digital tools and agile methods - are able to deal with social and organisational issues of project management - are able to recognise points of friction, conflicts as well as warning signals and are able to design a scenario against failure of the project - are able to develop sustainable solutions and strategies.
Inhalt *Contents*	**Controlling** - Concepts and tasks of corporate controlling - Structure of corporate controlling - Design of information systems and basics of key figures (KPIs) - Instruments of cost accounting and cost management (target costing, lifecycle costing, activity-based costing) - Selected operational controlling instruments (ABC-analysis, value benefit analysis, earned value analysis, decision tree technique, budgeting, forecasting) - Selected strategic controlling instruments (balanced scorecard, benchmarking, risk controlling) - Basics of sustainability controlling (idea, concepts, tools) **Project Management** - Different project management concepts and methods - Basics of project controlling and scheduling - Core concepts of project management (e.g. project schedule, risk analysis, stakeholder analysis, cost-benefit analysis, milestones, agile methods, evaluation) - Selected project management methods and tools such as Kanban, Scrum, Gantt charts, agile methods and (digital) collaborative work
Prüfungsleistungen *Type of examination*	Performance record (PR) (partial assessments)
Medieneinsatz und Arbeitsformen *Use of media, Forms of work*	Besides conveying basic theoretical knowledge, this module includes examples and case studies that are discussed and worked on interactively, through exchanges with the lecturer and between students. The lecture includes media-supported presentations as well as contributions from (external) lecturers.
Literatur *Bibliography*	R. N. Anthony, V. Govindarajan, F. G. H. Hartmann, K. Kraus and G. Nilsson, *Management Control Systems,* 2nd ed. London, UK: McGraw-Hill, 2021. K. A. Merchant and W. A. Van Der Stede, *Management Control Systems: Performance Measurement, Evaluation and Incentives*, 4th ed. Harlow, UK: Pearson Education, 2017. A. Bhimani, C. T. Horngren and S. M. Datar, *Management and Cost Accounting*, 7th ed. Harlow, UK: Pearson, 2019. R. K. Wysocki, *Effective Project Management: Traditional, Agile, Extreme, Hybrid, 8*th ed. Indianapolis, Indiana, UK: Wiley, 2019. H. Kerzner, *Project Management Metrics, KPIs, and Dashboards: a Guide to*

	Measuring and Monitoring Project Performance, 3d ed. Hoboken, NJ, USA: Wiley, 2017. H. Kerzner, *Project Management: A Systems Approach to Planning, Scheduling, and Controlling*, Hoboken, NJ, USA: Wiley, 2017. M. C. Layton, S. J. Ostermiller and D. J. Kynaston, *Agile Project Management For Dummies*, 3th ed. Indianapolis, Indiana, UK: Wiley, 2020.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**5.5**
	Semester:	**5**
	WHS:	**2**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**5.5 Interdisciplinary Project**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	N.N.
Dozent:in *Teaching personnel*	Various lecturers from the Department of Engineering and Industrial Design
Sprache *Language*	Mainly German, English
Curriculum, Modultyp *Curriculum, Type of module*	StREaM, Compulsory module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	2 WHS Project
Arbeitsaufwand *Student workload*	150 Hrs. Total 30 Hrs. Contact time 120 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	1.6, 2.6, 3.6, 4.6, 5.6 (concurrently) German as a Foreign Language (CEFR, level B2 completed)
Modulziele / angestrebte Lernergebnisse *Module objectives / Learning Outcomes*	Today complex products are usually developed by teams consisting of members with different professional backgrounds. Good results can be obtained only if the team members are willing to mutually honour their different expertises and to consider one another as partners. The objective of this module is to allow students to gain an in-depth experience with collaboration and cooperation across different disciplines.* Upon completion of this module, the students will be able to: - apply the competencies they have acquired during their studies to a practical student project with a given topic - share and link theoretical knowledge across disciplines and use their interdisciplinary knowledge to realise project tasks - work and communicate (more) effectively in small interdisciplinary and intercultural teams - plan and manage tasks and resources in their respective team/project, also while using digital tools - prepare project documentations - reflect upon their learning and working processes, individually and as a team. *The module *Interdisciplinary Project* is compulsory for all Bachelor degree students at the Department of Engineering and Industrial Design.

Inhalt *Contents*	The emphasis of this module is less on gaining additional technical expertise and more on creating an opportunity for students to learn together and from each other, through collaboratively developing a complex product and reflecting upon their learning and working processes. In the beginning of the module, the students and the lecturer(s) will define a practical work order and clarify other organisational questions. The module also familiarises students with project management tools for engineers.
Prüfungsleistungen *Type of examination*	Project report (Pro), Presentation (Pre)
Medieneinsatz und Arbeitsformen *Use of media, Forms of work*	Regular project meetings and consultations
Literatur *Bibliography*	J. M. Nicholas and H. Steyn, *Project Management for Engineering, Business and Technology*, 6th ed. Abingdon, Oxon, NY, USA: Routledge, 2020.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**5.6**
	Semester:	**5**
	WHS:	**4**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**5.6 German as a Foreign Language / Other Foreign Language (C1)**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Beatrice Schwarz-Buchholz (M. A.) (German as a Foreign Language)
Dozent:in *Teaching personnel*	Beatrice Schwarz-Buchholz (M. A.) (German as a Foreign Language) and other lecturers (Other Foreign Language)
Sprache *Language*	German / Other Foreign Language
Zuordnung zum Curriculum, Modultyp *Curriculum, Type of module*	StREaM, Compulsory module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	4 WHS Seminar
Arbeitsaufwand *Student workload*	150 Hrs. Total 60 Hrs. Contact time 90 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	See Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	
Modulziele / Angestrebte Lernergebnisse *Module objectives / Learning outcomes*	**German as a Foreign Language** Upon completion of this module, students will: - have developed speaking, listening, writing and reading skills in the German language at level A1 of the Common European Framework of Reference for Languages (CEFR) an can communicate in German according to this level - understand and can take into consideration, when communicating, aspects relating to German regional and cultural studies. **Other Foreign Language** German native speakers or students who already have the relevant German skills as defined in the Study and Examination Regulations (B2) will be required to developed comparable skills in another foreign language that is not the language of instruction (English). For information on the corresponding language offer, please contact your programme coordinator and/or director.
Inhalt	Please refer to the CEFR:

Contents	https://www.coe.int/en/web/common-european-framework-reference-languages
Prüfungsleistungen *Type of examination*	Language examination (LE) (“successfully completed” / “not successfully completed”)
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	Interactive seminar including various media, handouts, exercises, (intercultural) communication training, blended learning (using the platform Moodle). Students work individually and in groups.
Literatur *Bibliography*	Various resources (including resources available via Moodle). Literature will be announced at the beginning of the module.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**6.1**
	Semester:	**6**
	WHS:	**2-4**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**6.1 Compulsory elective module (online) (see Appendix 1)**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	See Appendix 1
Dozent:in *Teaching personnel*	See Appendix 1
Sprache *Language*	English / German
Zuordnung zum Curriculum, Modultyp *Curriculum, Type of module*	StREaM, Compulsory elective module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	2-4 WHS
Arbeitsaufwand *Student workload*	150 Hrs. Total 30-60 Hrs. Contact time 120-90 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	See Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	Depending on Compulsory elective module
Modulziele / Angestrebte Lernergebnisse *Module objectives / Learning outcomes*	Depending on Compulsory elective module
Inhalt *Contents*	Depending on Compulsory elective module
Prüfungsleistungen *Type of examination*	Depending on Compulsory elective module
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	Depending on Compulsory elective module
Literatur *Bibliography*	Depending on Compulsory elective module

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**6.2**
	Semester:	**6**
	WHS:	**3**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**6.2 Academic Skills Refresher and Internship Mentoring (online)**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Prof. Dr. rer. nat. Olaf Ueberschär
Dozent:in *Teaching personnel*	Prof. Dr. rer. nat. Olaf Ueberschär and other lecturers
Sprache *Language*	English
Zuordnung zum Curriculum, Modultyp *Curriculum, Type of module*	StREaM, Compulsory module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	3 WHS Recitation (one of which is for Internship Mentoring)
Arbeitsaufwand *Student workload*	150 Hrs. Total 45 Hrs. Contact time 105 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	See Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	Module(s): 1.5 Intercultural Communication and Participation 2.5 Scientific Project and Academic Skills 6.4 Portfolio (Reflection and Personal Development) (semesters 1 to 5 and concurrently)
Modulziele / angestrebte Lernergebnisse *Module objectives / Learning outcomes*	During this module, students refresh their knowledge of the scientific method and practice their skills in academic writing and presenting. They also reflect upon the experiences they gather and the lessons they learn during their internship phase (optional: study abroad phase). Upon completion of this module, students will be able to: - revise the structure and outline of a Bachelor thesis and of research papers - understand and use scientific language as well as common technical terms and phrases and are able to formulate briefly and precisely, both in writing and in speaking - create graphically appealing charts and figures based on given empirical data - use statistics software for simple and medium-level statistical analyses - give a summarising talk on a predefined research topic - reflect practical experiences (here: gathered during their internship phase or study abroad phase) and put into words what they teach them with regard to their personal development and their future professional activity.

Inhalt *Contents*	**Academic Skills Refresher** - Revision of the scientific method: aims, methods, hypotheses, pitfalls - Exercises in literature survey, effective reference management and citation - Revision of how to write a thesis: outline, contents, language, typical phrases - Spotlight on how to create adequate charts and figures for scientific purposes - Spotlight on how to use IBM SPSS for statistical analyses **Internship Mentoring** Communication with academic supervisor and exercises, e. g. fostering self-reflection.
Prüfungsleistungen *Type of examination*	Seminar contribution (SC) ("successfully completed", "not successfully completed")
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	Academic Skills Refresher: course notes and additional resources including computer presentations, multimedia elements, research articles, exercises. Internship Mentoring: consultations, exercises.
Literatur *Bibliography*	R. Murray, *How to Write a Thesis.* Maidenhead, Berkshire, UK: Open University Press, 2017. T. Deetjen, *Published: a guide to literature review, outlining, experimenting, visualization, writing, editing, and peer review for your first scientific journal article*, Productive Academic, 2020.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**6.3**
	Semester:	**6**
	WHS:	**-**
	Credit Points:	**15**

Modulbezeichnung *Module title*	**6.3 Internship** (Optionally, this internship phase may be carried out as a study abroad phase.)
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Prof. Dr. Gretchen Schaupp (Programme director)
Dozent:in *Teaching personnel*	Academic supervisor, Kay Bender (Internship Officer)
Sprache *Language*	Depending on the internship country / company.
Zuordnung zum Curriculum, Modultyp *Curriculum, Type of module*	StREaM, Compulsory module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	- WHS -
Arbeitsaufwand *Student workload*	450 Hrs. Total (full-time) 400 Hrs. Contact-time 50 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	Students must provide evidence of the successful acquisition of at least 130 CP from the Bachelor degree´s module examinations.
Empfohlene Voraussetzungen *Recommended prerequisites*	Module(s): 1.5 Intercultural Communication and Participation 5.5 Interdisciplinary Project 6.2 Academic Skills Refresher and Internship Mentoring (concurrently) 6.4 Portfolio (Reflection and Personal Development) (Semesters 1 to 5 and concurrently) Please note: This internship phase may optionally be carried out as a study abroad phase (see Study and Examination Regulations).
Modulziele / angestrebte Lernergebnisse *Module objectives / Learning outcomes*	The Internship module comprises full-time employment of 10 weeks´ duration and is generally completed in a company or institution, while working on tasks relating to the degree programme. During their internship, the students familiarise themselves with the organisational context and business processes of a company or institution. They apply and extend the knowledge and competencies (technical, personal, social, methodical, intercultural, language) they have acquired during their studies. Upon completion of this module, the students will be able to work independently on profession-related tasks, in an intercultural environment. Concurrently to their internship phase (optionally: study abroad phase), the students attend the Academic Skills Refresher and Internship Mentoring module (online module; see description 6.2). During the Internship Mentoring part, the

	students will regularly communicate with their academic supervisor. They reflect upon the experiences gathered and the lessons learned during their internship phase (optionally: study abroad phase). If this module is carried out in the form of an internship, this internship phase can be combined with the internship phase in the 7th semester.
Inhalt *Contents*	Activities are for example: - Familiarising oneself with the organisational context and business processes of a company or institution - Transferring knowledge to advanced practical tasks (e. g. solving practical problems) and working on these tasks independently - Working alone and with others in a team - Applying and extending one´s knowledge and competencies, also in terms of the respective working culture(s) (national, regional, organisational etc.) and language(s).
Prüfungsleistungen *Type of examination*	Internship / Practical report (IR) („successfully completed“ / „not successfully completed“)
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	Depending on the tasks completed during the internship
Literatur *Bibliography*	Depending on the tasks completed during the internship

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**6.4**
	Semester:	**6**
	WHS:	**2**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**6.4 Portfolio (Reflection and Personal Development)** (in semester 6 the Portfolio sessions will take place online)
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Prof. Dr. Gretchen Schaupp
Dozent:in *Teaching personnel*	Prof. Dr. Gretchen Schaupp and other lecturer(s)
Sprache *Language*	English
Zuordnung zum Curriculum, Modultyp *Curriculum, Type of module*	StREaM, Compulsory module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	2 WHS Recitation
Arbeitsaufwand *Student workload*	150 Hrs. Total 30 Hrs. Contact time 120 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	Module(s): 6.4 Portfolio (Reflection and Personal Development) sessions from semesters 1 to 5
Modulziele / angestrebte Lernergebnisse *Module objectives / Learning outcomes*	This module runs from semesters 1 to 6 and is designed to support the students´ personal and professional development. It is also designed to help the students create their professional profile and prepare them for their entry into professional life (Career Pathways). The students are accompanied and advised by lecturers and other experts both from within and outside of the university. The module is completed during semester 6. In semester 6 the Portfolio sessions take place online. Upon completion of this module, the students will be able to: - critically reflect upon and document their development of competencies as well as their personal development including strengths and weaknesses, coping with external requirements, e. g. academic, professional - evaluate their learning progress - identify individual training needs, continually improve themselves and develop their professional profile - analyse, contrast and evaluate learning and working experiences in intercultural settings - critically reflect upon their own actions as individuals and as professionals, including the effects these actions have, in the working world and for society,

	while drawing, e. g., on ethical aspects and personal values - create a portfolio and promote themselves to potential employers.
Inhalt *Contents*	Contents and activities are for example: - Critical reflection of the development of one´s own competencies and learning/working experiences gathered during the course of the studies - Analysis of one´s own potential and training needs - Professionalism and professional development - Creating a portfolio - Promoting oneself to future internship companies and employers - Pursuing one´s studies through a Master programme
Prüfungsleistungen *Type of examination*	Portfolio (Po) (“successfully completed”, “not successfully completed”)
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	Computer presentations, consultations (individually and in groups), guest talks and exercises (e. g. fostering self-reflection). In semester 6 the Portfolio sessions will take place online.
Literatur *Bibliography*	Various resources, e.g. related to career planning. Bass, R. & Eynon, B. (Eds.). The Difference that Inquiry Makes. A Collaborative Case Study of Technology and Learning, from the Visible Knowledge Project. https://blogs.commons.georgetown.edu/vkp/files/2009/03/bass-revised-2.pdf

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**7.1**
	Semester:	**7**
	WHS:	**-**
	Credit Points:	**18**

Modulbezeichnung *Module title*	**7.1 Internship (Bachelor Project)**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Prof. Dr. Gretchen Schaupp (Programme director)
Dozent:in *Teaching personnel*	Academic supervisor
Sprache *Language*	Depending on the internship country / company.
Zuordnung zum Curriculum, Modultyp *Curriculum, Type of module*	StREaM, Compulsory module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	- WHS -
Arbeitsaufwand *Student workload*	540 Hrs. Total (480) Hrs. Contact time (company, institution) (60) Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	Students must provide evidence of the successful acquisition of 160 CP from the Bachelor degree´s module examinations. If the two internship phases in the 6th and 7th semesters are combined, proof of 130 CP is sufficient. See Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	Module(s): 1.6, 2.6, 3.6, 4.6, 5.6 German as a Foreign Language (esp. for internships that (also) require German as a working language) It is furthermore recommended to join the Bachelor project and the Bachelor thesis (see module 7.2).
Modulziele / Angestrebte Lernergebnisse *Module objectives / Learning outcomes*	The Internship (Bachelor Project) module comprises full-time employment of 12 weeks´ duration and is generally completed in a company or institution, while working on a project relating to the degree programme. During their profession-oriented Internship (Bachelor Project), the students apply the knowledge and competencies (technical, personal, social, methodical, intercultural, language) they have acquired during their studies. Upon completion of this module, the students will be able to conduct independent scientific work on a profession-related project, individually and with others in a team, in an intercultural environment.
Inhalt *Contents*	Activities are for example (in addition to the activities stated for 6.3): - Familiarising oneself with the company/institution

	- Identifying demands - Researching adequate state-of-the-art literature - Developing and evaluating solution approaches - Implementing the favoured solution approach (if possible) - Carrying out hardware and software tasks - Creating and designing - Evaluating aspects of sustainability (related to economy, ecology and society) - Carrying out surveys, laboratory tests, analyses and functionality tests - Commissioning components and evaluating their performance - Preparing the Internship / Practical report
Prüfungsleistungen *Type of examination*	Internship / Practical report (IR) („successfully completed“ / „not successfully completed“)
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	Depending on the realised Bachelor project
Literatur *Bibliography*	Depending on the realised Bachelor project

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**7.2**
	Semester:	**7**
	WHS:	**-**
	Credit Points:	**12**

Modulbezeichnung *Module title*	**7.2 Bachelor Thesis and Defense**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Prof. Dr. Gretchen Schaupp (Programme director)
Dozent:in *Teaching personnel*	Academic supervisor
Sprache *Language*	English
Zuordnung zum Curriculum, Modultyp *Curriculum, Type of module*	StREaM, Compulsory module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	- WHS -
Arbeitsaufwand *Student workload*	360 Hrs. Total
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	Students must have acquired at least 170 CP from the Bachelor degree´s module examinations, including the CP for the first four semesters of the degree programme. See Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	Please note: It is recommended to join the Bachelor thesis and the Bachelor project (see module 7.1).
Modulziele / angestrebte Lernergebnisse *Module objectives / Learning outcomes*	Upon completion of this module, students will be able to work independently and in a scientific manner within a given time frame on a research topic (in general a practical problem) relating to the degree programme.
Inhalt *Contents*	Activities are for example: - Defining a topic and a research question - Researching adequate state-of-the-art literature - Developing and evaluating solution approaches - Implementing the favoured solution approach - Carrying out hardware and software works - Creating and designing - Evaluating aspects of sustainability (related to economy, ecology and society) - Carrying out surveys, laboratory tests, analyses and functionality tests - Commissioning components and evaluationg their performance - Preparing the Bachelor thesis and defense

Prüfungsleistungen *Type of examination*	Bachelor thesis (including the defense)
Medieneinsatz, Arbeitsformen *Use of media, Forms of work*	Depending on the topic of the Bachelor thesis
Literatur *Bibliography*	Depending on the topic of the Bachelor thesis

Appendix 1 - List of Compulsory elective modules

Climate Change and Adaptation Management
(Prof. Dr. rer nat. Frido Reinstorf, Prof. Dr. rer. nat. Petra Schneider)
Semester 6 / Winter Semester (online)

Digital Business I
(Prof. Dr. Jens-Martin Loebel)
Semester 5 / Summer Semester

Digital Business II
(Prof. Dr. Jens-Martin Loebel)
Semester 5 / Summer Semester
or Semester 6 / Winter Semester (online)

Fatigue and Fracture Mechanics
(Prof. Dr.-Ing. Christian Willberg)
Semester 5 / Summer Semester

Finite-Element-Method
(Prof. Dr.-Ing. Christian Willberg)
Semester 5 / Summer Semester

Fundamentals of Geotechnical Engineering
(Prof. Dr.-Ing. René Sonnenberg)
Semester 5 / Summer Semester

Human Resource Management
(Prof. Dr. Gretchen Schaupp)
Semester 6 / Winter Semester (online)

Renewable Energy Systems II
(Prof. Dr.-Ing. Jörg Reuter)
Semester 6 / Winter Semester (online)

Sustainable Buildings
(Prof. Dr.-Ing. Claudia Fülle)
Semester 5 / Summer Semester

Sustainable Mobility
(Prof. Dr.-Ing. Konrad Steindorff, Prof. Dr.-Ing. habil. Przemyslaw Komarnicki)
Semester 5 / Summer Semester

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme „Sustainable Resources, Engineering and Management (StREaM)“ (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**6.1**
	Semester:	**6**
	WHS:	**4**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**Climate Change and Adaptation Management**
Modulniveau *Module level:*	Bachelor Programme Level
Modulverantwortliche:r *Module leader*	Prof. Dr. rer. nat. habil. Frido Reinstorf
Dozent:in *Teaching personnel*	Prof. Dr. rer. nat. habil. Frido Reinstorf, Prof. Dr. rer. nat. Petra Schneider
Sprache *Language*	English
Zuordnung zum Curriculum *Curriculum and Type of module*	StREaM, Compulsory elective module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	2 WHS Lecture 2 WHS Project
Arbeitsaufwand *Student workload*	150 Hrs. Total 60 Hrs. Contact time 90 Hrs. Self-study and project work
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	See Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	
Modulziele/angestrebte Lernergebnisse *Module objectives/ Learning outcomes*	The lecture provides the scientific basis for understanding the processes of natural and man-made climate change. Upon completion of this module, students: - learn the manner of effects of climate change on the natural and man-made systems and are able to identify links to human society and in particular its natural resources - are able to identify sensitive problem areas by applying cooperative learning methods - gain insight to options for action to reach the highest possible resilience to the effects of climate change - learn strategies to adopt on or to mitigate affects relating to environmental changes - are able to analyze the possibilities of practical implementation in terms of demonstration projects using practical examples in the sense of a virtual laboratory - are able to develop climate change adaptation strategies in order to establish resilient cities and communities, based on nature-based solutions, green infrastructure planning, disaster risk preparedness and ecosystem-based adaptation and mitigation approaches.

Inhalt *Contents*	- Scientific basis of climate change and its processes - Global significance of climate change (by region) - Analysis of climate change effects on nature, technical and social infrastructures - Fields of action for adaptation management or mitigation of impacts - Adaptation or mitigation strategies to the impacts - Nature-based solutions, green infrastructure, Sustainable Urban Drainage Systems, ecosystem-based adaptation and mitigation - Practical investigation of implementation possibilities in terms of demonstration projects
Prüfungsleistungen *Type of examination*	Project Report (PR)
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	Use of media: blackboard, presentations, video, audio, learning platform, message forum, literature study, computer Forms of work: Face-to-face events, online events, group work or discussions (small groups on specific topics, large group (e.g. fishbowl)).
Literatur *Bibliography*	IPCC Assessment Reports (https://www.ipcc.ch/reports/) T. Westerhold, N. Marwan, A. J. Drury, D. Liebrand, C. Agnini, E. Anagnostou, S. K. Barnet, S. M. Bohaty, D. De Vleeschouwer, F. Florindo, T. Frederichs, D. A. Hodell, A. E. Holbourn, D. Kroon, V. Lauretano, K. Littler, L. J. Lourens, M. Lyle, H. Pälike, U. Röhl, J. Tian, R. H. Wilkens, P. A. Wilson, and J. C. Zachos, "An astronomically dated record of Earth's climate and its predictability over the last 66 million years," *Science*, vol. 369, no. 6509, pp. 1383–1387, Sep. 2020. G. Myhre, D. Shindell, F.-M. Bréon, W. Collins, J. Fuglestvedt, J. Huang, D. Koch, J.-F. Lamarque, D. Lee, B. Mendoza, T. Nakajima, A. Robock, G. Stephens, T. Takemura, and H. Zhan, "Anthropogenic and Natural Radiative Forcing" in *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change,* T.F. Stocker, D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex, and P.M. Midgley, Eds. Cambridge, UK: Cambridge University Press, pp. 661, 688–691, 2013. G.W. Yohe, R.D. Lasco, Q.K. Ahmad, N.W. Arnell, S.J. Cohen, C. Hope, A.C. Janetos and R.T. Perez "Executive summary (book chapter: Perspectives on climate change and sustainability)," in *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change,* M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden, and C.E. Hanson, Eds. Cambridge, UK: Cambridge University Press, p. 813, 2007. N. Kabisch, H. Korn, J. Stadler and A. Bonn, *Nature-Based Solutions to Climate Change Adaptation in Urban Areas: Linkages between Science, Policy and Practice*. Cham, Switzerland: Springer International Publishing, 2017. International Union for Conservation of Nature IUCN (2018): Nature-based Solutions. Available online at https://www.iucn.org/our-work/nature-based-solutions

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme „Sustainable Resources, Engineering and Management (StREaM)“ (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**		Module no.:	**5.1 or 5.2**
		Semester:	**5**
		WHS:	**4**
		Credit Points:	**5**

Modulbezeichnung *Module title*	**Digital Business - Projects & Applications I**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Prof. Dr. Jens-Martin Loebel
Dozent:in *Teaching personnel*	Prof. Dr. Jens-Martin Loebel and other lecturer(s)
Sprache *Language*	English
Zuordnung zum Curriculum und Modultyp *Curriculum and Type of module*	StREaM, Compulsory elective module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	4 WHS Seminar-style lecture
Arbeitsaufwand *Student workload*	150 Hrs. Total 60 Hrs. Contact time 90 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	See Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	Module(s): 3.3 Information Technology and Data Science 3.5 Sustainable Production Management and Global Supply Chains 4.5 Product Development and Production Processes
Modulziele / Angestrebte Lernergebnisse *Module objectives / Learning outcomes*	This module offers a practical introduction to the connection between digitalization / digital technologies and the field of sustainability. Based on the Sustainable Development Goals 8-10 (Sustainable Development as an Opportunity for All, Industry, Innovation and Infrastructure, Reducing Inequalities) of the United Nations, technologies are presented as examples and examined and tested in practical projects with regard to their potential and their contribution to sustainable business. Options for new types of digital business models in small and medium-sized enterprises in the many dimensions of sustainability will be demonstrated on topics selected with students. If possible and appropriate, a project can be worked on in greater depth in two completed sub-projects/tasks in the follow-up module Digital Business II. The selection of the topic complexes and contents covered in the module is determined together with the students at the beginning of the semester. The topic complexes are to be understood as alternatives or options. Accordingly, only a selection of the qualification objectives listed below will be covered in the module:

	(1) ERP-systems Upon completion of this module, students: - are able to define the goals, tasks and strategies of business IT application systems - gain insight into the functioning of the industrial automation pyramid - get to know the functionalities of MRPI, MRPII, PPS, MES and ERP systems - will be able to define the basic functionalities of ERP systems, using SAP 4/HANA as an example - are able to transfer and apply correlations of business management issues in implementation cases in the ERP system - are able to display complex issues in the SAP system (e.g. production planning, merchandise management, warehousing) (2) Industry 4.0 Upon completion of this module, students: - are familiar with the subject area of Industry 4.0 / Logistics 4.0 - are able to demonstrate basic terminology and specific application examples of Industry 4.0 - understand connections between the system level of production management (planning level) and the executive production control level - gain insight in "Industry 4.0 ready" production and logistics processes using mini-demonstrators (cyber-physical production and logistics systems CPPS/CPLS) - understand complex interrelationships and procedures of production technology and logistics processes and can relate these to the production planning level and understand for example client order processes in digitalised Industry 4.0 processes (e.g. decentralised, CPS-controlled order processing) (3) Games/Gamification Upon completion of this module, students: - have basic knowledge of programming computer games as well as skills in using a game engine and a development environment - are able to apply concepts of tool-supported IT project management in games production - are able to resume and explain the basics, principles and possible applications of gamification concepts - evaluate the suitability of tasks and processes for gamification from an ethical, psychological and technical perspective - are able to practically apply gamification concepts in corporate contexts (4) VR/AR technology applications Upon completion of this module, students: - know the system models and basic principles of augmented and virtual reality systems - are able to evaluate and assess the effort required for the development of such systems - understand the positive and negative effects of VR/AR systems - are able to develop small VR/AR application concepts or solutions in a business context
Inhalt *Contents*	(1) ERP-systems - Introduction to the system architecture of the industrial manufacturing pyramid - Introduction to and independent use of ERP systems using the example of SAP 4/HANA - Working on case-based topics using the flipped classroom concept on various corporate functions, such as warehouse management, materials management, production planning, controlling, finance, maintenance or

	project management - Project work to learn how to work independently with ERP systems (2) Industry 4.0 - Introduction to Industry 4.0 /Logistics 4.0 and discussion of current application examples of vertical and horizontal integration in production and logistics - Use of practice-based Industry 4.0 and Logistics 4.0 demonstrators (Mini Factory Labs, e.g. Festo Didactics, Fischer-Technik Factory 4.0) as a practice-oriented teaching assignment - Work on case studies and digitalisation projects with Industry 4.0 and Logistics 4.0 relevance (3) Games / Gamification - Introduction to the use of a professional game engine (e.g. Unity) for product creation or gamification of business processes - In addition, introduction to programming script sequences (e.g. with C#), a development environment (e.g. Visual Studio Code) and tool-supported (e.g. versioning with Git, agile management with Redmine) IT project management with a suitable development model (e.g. Scrum) - Introduction to potentials, areas of application, psychological motivational theories, design elements and framework conditions for the use of gamification concepts and models from a business perspective and entrepreneurial practice - Project work to acquire an independent approach to game engines and associated business and sales models (4) VR/AR applications - Introduction and overview of VR/AR concepts and technologies, historical developments and technical milestones - Theoretical foundations as well as application concepts of augmented and virtual reality in corporate practice, introduction to interaction models - Animation systems for 3D visualisation (e.g. with Unity) - Project work to acquire independent handling of VR/AR hardware, camera control and development environments
Prüfungsleistungen *Type of examination*	Presentation (Pre) / Portfolio (Po)
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	Case studies, discussion, teamwork, group projects, project work, teamwork, discussion, conceptual and prototypical work, computer exercises, service learning, workshop learning, case studies, research, independent work on exercises, E-Portfolio
Literatur *Bibliography*	M. Schenk, S. Wirth and E. Müller, *Factory Planning Manual. Situation-Driven Production Facility Planning*, Berlin/Heidelberg, Germany: Springer, current edition. S. Sarferaz, *Compendium on Enterprise Resource Planning*, Berlin/Heidelberg, Germany: Springer, current edition . **Literature for the IT application:** UCC-own teaching materials and Power Point presentations as well as internal case study material - Market, Functional and Conceptual View based on SAP S/4HANA. K. Weihrauch and G. Keller*, Produktionsplanung und -steuerung mit SAP: Einführung in die diskrete Fertigung und die Serienfertigung mit SAP PP.* Bonn, Germany: SAP PRESS, 2001. B. Ritter, *Enterprise Resource Planning – ERP.* Frechen, Germany: mitp, 2005.

	R. Dörner, S. Göbel, S. Effelsberg and J. Wiemeyer, *Serious Games: Foundations, Concepts and Practice,* Cham, Switzerland: Springer, current edition. H. Routledge, *Why Games Are Good For Business: How to Leverage the Power of Serious Games, Gamification and Simulations*, London, UK: Palgrave Macmillan, current edition. R. Dörner, R., W. Broll, P. Grimm and B. Jung, *Virtual and Augmented Reality (VR/AR): Foundations and Methods of Extended Realities (XR)*, Cham, Switzerland: Springer, current edition. S. Badotra, S. Tanwar, A. Rana, S. Sindhwani and S. Kannan, *Handbook of Augmented and Virtual Reality (Augmented and Virtual Reality, 1),* Berlin, Germany: De Gruyter, current edition. Unity's own web documentation and tutorials.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**5.1, 5.2 or 6.1**
	Semester:	**5 or 6**
	WHS:	**4**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**Digital Business - Projects & Applications II**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Prof. Dr. Jens-Martin Loebel
Dozent:in *Teaching personnel*	Prof. Dr. Jens-Martin Loebel and other lecturer(s)
Sprache *Language*	English
Zuordnung zum Curriculum und Modultyp *Curriculum and Type of module*	StREaM, Compulsory elective module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	4 WHS Seminar-style lecture
Arbeitsaufwand *Student workload*	150 Hrs. Total 60 Hrs. Contact time 90 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	See Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	Module(s): 3.3 Information Technology and Data Science 3.5 Sustainable Production Management and Global Supply Chains 4.5 Product Development and Production Processes
Modulziele / Angestrebte Lernergebnisse *Module objectives / Learning outcomes*	This module offers a practical introduction to the connection between digitalization / digital technologies and the field of sustainability. Based on the Sustainable Development Goals 8-10 (Sustainable Development as an Opportunity for All, Industry, Innovation and Infrastructure, Reducing Inequalities) of the United Nations, technologies are presented as examples and examined and tested in practical projects with regard to their potential and their contribution to sustainable business. Options for new types of digital business models in small and medium-sized enterprises in the many dimensions of sustainability will be demonstrated on topics selected with students. If possible and appropriate, a project can be worked on in greater depth in two completed sub-projects/tasks in conjunction with the previous module Digital Business I. The selection of the topic complexes and contents covered in the module is determined together with the students at the beginning of the semester. The topic complexes are to be understood as alternatives or options. Accordingly, only a selection of the qualification objectives listed below will be covered in the module:

	(1) ERP-systems Upon completion of this module, students: - are able to define the goals, tasks and strategies of business IT application systems - gain insight into the functioning of the industrial automation pyramid - get to know the functionalities of MRPI, MRPII, PPS, MES and ERP systems - will be able to define the basic functionalities of ERP systems, using SAP 4/HANA as an example - are able to transfer and apply correlations of business management issues in implementation cases in the ERP system - are able to display complex issues in the SAP system (e.g. production planning, merchandise management, warehousing) (2) Industry 4.0 Upon completion of this module, students: - are familiar with the subject area of Industry 4.0 / Logistics 4.0 - are able to demonstrate basic terminology and specific application examples of Industry 4.0 - understand connections between the system level of production management (planning level) and the executive production control level - gain insight in "Industry 4.0 ready" production and logistics processes using mini-demonstrators (cyber-physical production and logistics systems CPPS/CPLS) - understand complex interrelationships and procedures of production technology and logistics processes and can relate these to the production planning level and understand for example client order processes in digitalised Industry 4.0 processes (e.g. decentralised, CPS-controlled order processing) (3) Games/Gamification Upon completion of this module, students: - have basic knowledge of programming computer games as well as skills in using a game engine and a development environment - are able to apply concepts of tool-supported IT project management in games production - are able to resume and explain the basics, principles and possible applications of gamification concepts - evaluate the suitability of tasks and processes for gamification from an ethical, psychological and technical perspective - are able to practically apply gamification concepts in corporate contexts (4) VR/AR technology applications Upon completion of this module, students: - know the system models and basic principles of augmented and virtual reality systems - are able to evaluate and assess the effort required for the development of such systems - understand the positive and negative effects of VR/AR systems - are able to develop small VR/AR application concepts or solutions in a business context
Inhalt *Contents*	(1) ERP-systems - Introduction to the system architecture of the industrial manufacturing pyramid - Introduction to and independent use of ERP systems using the example of SAP 4/HANA - Working on case-based topics using the flipped classroom concept on various corporate functions, such as warehouse management, materials management, production planning, controlling, finance, maintenance or

	project management - Project work to learn how to work independently with ERP systems (2) Industry 4.0 - Introduction to Industry 4.0 /Logistics 4.0 and discussion of current application examples of vertical and horizontal integration in production and logistics - Use of practice-based Industry 4.0 and Logistics 4.0 demonstrators (Mini Factory Labs, e.g. Festo Didactics, Fischer-Technik Factory 4.0) as a practice-oriented teaching assignment - Work on case studies and digitalisation projects with Industry 4.0 and Logistics 4.0 relevance (3) Games / Gamification - Introduction to the use of a professional game engine (e.g. Unity) for product creation or gamification of business processes - In addition, introduction to programming script sequences (e.g. with C#), a development environment (e.g. Visual Studio Code) and tool-supported (e.g. versioning with Git, agile management with Redmine) IT project management with a suitable development model (e.g. Scrum) - Introduction to potentials, areas of application, psychological motivational theories, design elements and framework conditions for the use of gamification concepts and models from a business perspective and entrepreneurial practice - Project work to acquire an independent approach to game engines and associated business and sales models (4) VR/AR applications - Introduction and overview of VR/AR concepts and technologies, historical developments and technical milestones - Theoretical foundations as well as application concepts of augmented and virtual reality in corporate practice, introduction to interaction models - Animation systems for 3D visualisation (e.g. with Unity) - Project work to acquire independent handling of VR/AR hardware, camera control and development environments
Prüfungsleistungen *Type of examination*	Presentation (Pre) / Portfolio (Po)
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	Case studies, discussion, teamwork, group projects, project work, teamwork, discussion, conceptual and prototypical work, computer exercises, service learning, workshop learning, case studies, research, independent work on exercises, E-Portfolio
Literatur *Bibliography*	M. Schenk, S. Wirth and E. Müller, *Factory Planning Manual. Situation-Driven Production Facility Planning*, Berlin/Heidelberg, Germany: Springer, current edition. S. Sarferaz, *Compendium on Enterprise Resource Planning*, Berlin/Heidelberg, Germany: Springer, current edition . **Literature for the IT application:** UCC-own teaching materials and Power Point presentations as well as internal case study material - Market, Functional and Conceptual View based on SAP S/4HANA. K. Weihrauch and G. Keller*, Produktionsplanung und -steuerung mit SAP: Einführung in die diskrete Fertigung und die Serienfertigung mit SAP PP.* Bonn, Germany: SAP PRESS, 2001. B. Ritter, *Enterprise Resource Planning – ERP.* Frechen, Germany: mitp, 2005.

	R. Dörner, S. Göbel, S. Effelsberg and J. Wiemeyer, *Serious Games: Foundations, Concepts and Practice,* Cham, Switzerland: Springer, current edition. H. Routledge, *Why Games Are Good For Business: How to Leverage the Power of Serious Games, Gamification and Simulations*, London, UK: Palgrave Macmillan, current edition. R. Dörner, R., W. Broll, P. Grimm and B. Jung, *Virtual and Augmented Reality (VR/AR): Foundations and Methods of Extended Realities (XR)*, Cham, Switzerland: Springer, current edition. S. Badotra, S. Tanwar, A. Rana, S. Sindhwani and S. Kannan, *Handbook of Augmented and Virtual Reality (Augmented and Virtual Reality, 1),* Berlin, Germany: De Gruyter, current edition. Unity's own web documentation and tutorials.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme „Sustainable Resources, Engineering and Management (StREaM)“ (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**5.1 or 5.2**
	Semester:	**5**
	WHS:	**4**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**Fatigue and Fracture Mechanics**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Prof. Dr.-Ing. Christian Willberg
Dozent:in *Teaching personnel*	Prof. Dr.-Ing. Christian Willberg
Sprache *Language*	English
Zuordnung zum Curriculum und Modultyp *Curriculum and Type of module*	StREaM, Compulsory elective module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	2 WHS Lecture 2 WHS Recitation
Arbeitsaufwand *Student workload*	150 Hrs. Total 60 Hrs. Contact time 90 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	See Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	Module(s): 2.4 Engineering Mechanics and Fluid Mechanics 3.4 Machine Design
Modulziele/angestrebte Lernergebnisse *Module objectives/ Learning outcomes*	Upon completion of this module, students: - have a fundamental understanding of Mechanics of fracture of brittle and ductile materials; linear elastic fracture mechanics; elastic-plastic fracture; fracture testing; numerical methods; creep and fatigue fracture. - will be able to evaluate material testing data and extrapolate a lifetime prediction as well as be able to evaluate a variety of influencing factors
Inhalt *Contents*	- Introduction to the mechanics of fracture of brittle and ductile materials - Basics of linear-elastic fracture mechanics (LEFM) and elastic-plastic fracture mechanics (EPFM) - Time dependent fracture including creep and fatigue crack growth - Introduction to methods to experimentally determine fracture properties
Prüfungsleistungen *Type of examination*	Performance Record (PR)
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	PowerPoint, Videos, Black- / Whiteboard, Resources are available on Moodle

Literatur *Bibliography*	T. L. Anderson, *Fracture Mechanics: Fundamentals and Applications*, 4th ed. Boca Raton, FL, USA: CRC Press, 2017. S. Suresh, *Fatigue of Materials*, 2nd ed. Cambridge, UK: Cambridge University Press, 1998.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme „Sustainable Resources, Engineering and Management (StREaM)“ (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**5.1 or 5.2**
	Semester:	**5**
	WHS:	**4**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**Finite-Element-Method**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Prof. Dr.-Ing. Christian Willberg
Dozent:in *Teaching personnel*	Prof. Dr.-Ing. Christian Willberg
Sprache *Language*	English
Zuordnung zum Curriculum und Modultyp *Curriculum and Type of module*	StREaM, Compulsory elective module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	2 WHS Lecture 2 WHS Seminar
Arbeitsaufwand *Student workload*	150 Hrs. Total 30 Hrs. Contact time 120 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	See Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	Module(s): 2.4 Engineering Mechanics and Fluid Mechanics 3.4 Machine Design
Modulziele/angestrebte Lernergebnisse *Module objectives/ Learning outcomes*	Upon completion of this module, students will be able to: - perform strength and vibration calculations using the finite element method - evaluate the possibilities and limits of vibration calculations using the finite element method
Inhalt *Contents*	- Introduction to the finite element method - Modeling of different geometries with volume elements, shell elements and beam elements - Strength calculation of complex components with different materials with screw preload and contacts - Vibration calculation of components: modal analysis, frequency analysis, transient analysis, PSD analysis - Optimization of components using FEA
Prüfungsleistungen *Type of examinations*	Term Paper (TP), Presentation (Pre)
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	Presentation (PDF), learnings videos, worksheets, computer practice

Literatur *Bibliography*	H.-H. Lee, *Finite Element Simulation.* Mission, KS, USA: SDC Publications, 2018. T. Stolarski, Y. Nakasone, and S. Yoshimoto, *Engineering Analysis with ANSYS Software,* 2nd ed. Oxford/Cambridge, UK: Butterworth-Heinemann, 2018.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme *Sustainable Resources, Engineering and Management (StREaM)* (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**5.1 or 5.2**
	Semester:	**5**
	WHS:	**3**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**Fundamentals of Geotechnical Engineering**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Prof. Dr.-Ing. René Sonnenberg
Dozent:in *Teaching personnel*	Prof. Dr.-Ing. René Sonnenberg
Sprache *Language*	English
Zuordnung zum Curriculum und Modultyp *Curriculum and Type of module*	StREaM, Compulsory elective module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	2 WHS Lecture 1 WHS Recitation (including laboratory work)
Arbeitsaufwand *Student workload*	150 Hrs. Total 45 Hrs. Contact time 105 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	See Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	Module(s): 1.2 Fundamentals of Natural Science 2.3 Mathematics 2 2.4 Engineering Mechanics and Fluid Mechanics
Modulziele / Angestrebte Lernergebnisse *Module objectives / Learning outcomes*	This module introduces students to the fundamentals of geotechnics as well as to different approaches of geotechnical design. Upon completion of this module, students: - know, understand and are able to explain complex processes of physical geology like formation and structure of soil masses and mechanical behaviour of soil - are able to identify geotechnical challenges, e. g. for foundations, in earthworks and assessment of slope stability - are able to reflect critically upon common geotechnical solutions and develop strategies for making geotechnical works more sustainable.
Inhalt *Contents*	Physical geology, basic soil mechanics, general geotechnical engineering and environmental aspects in geotechnical work. The content may include, but not be limited to: - Introduction to engineering geology - Structure of the earth, plate tectonics and endogenous processes - Weathering, erosion and mass movements - Rivers, glaciers and wind - Laboratory: Minerals, rock cycle and petrography - Geological campus - Slope-parallel failure (infinite slope)

	- Ground investigation and soil classification - Laboratory: Sieve analysis [document] - Laboratory: State limits and water content [document] - Laboratory: Proctor test [document] - Earth pressure - Sustainability in GeoT (incl. geothermal energy and soil improvement) - Pollutants in soil and soil remediation
Prüfungsleistungen *Type of examination*	Performance record (PR) (partial assessments)
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	Lecture with presentations (including student presentations), blackboard, Moodle learning platform to assist the process of self-studying
Literatur *Bibliography*	E. J. Tarbuck, F. K. Lutgens, D. G. Tasa and S. Linneman, *Earth: An Introduction to Physical Geology*, 13th ed. Hoboken, NJ, USA: Pearson, 2020. J. Knappett, R. F. Craig, *Craig's Soil Mechanics*, 9th ed. London, UK: CRC Press, 2019.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme „Sustainable Resources, Engineering and Management (StREaM)“ (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**6.1**
	Semester:	**6 (online)**
	WHS:	**3**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**Human Resource Management**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Prof. Dr. Gretchen Schaupp
Dozent:in *Teaching personnel*	Prof. Dr. Gretchen Schaupp
Sprache *Language*	English
Zuordnung zum Curriculum und Modultyp *Curriculum and Type of module*	StREaM, Compulsory elective module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	2 WHS Seminar 1 WHS Recitation
Arbeitsaufwand *Student workload*	150 Hrs. Total 45 Hrs. Contact time 105 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	See Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	
Modulziele/angestrebte Lernergebnisse *Module objectives/ Learning outcomes*	Upon completion of this module, students: - are able to define and illustrate the procedures in recruitment, training and development process of employees - know what expectations and demands different generations have on the labour market - are able to assess various methods of HR and select them for their sustainability and effectiveness in achieving success - are able to explain the specifics of HR in international and global organizations - are able to apply ethical and sustainable principles of organizational development and of staff development and release to real life scenarios and problems
Inhalt *Contents*	- Fundamental Aspects of Human Relations Management - Types of HR Professionals - Generations and their expectations on the labour market - Functions of HR, e.g. Recruitment and Selection, Training and Development, Compensation and Benefits, Workplace and Employee Health Management, Employee and Labor Relations - Sustainable HR - Compliance with legal, ethical and regulatory obligations in HR

	- Specifics of HR in international and global companies, e.g. international personnel development, cross cultural training, Personnel Deployment and Expatriate Management, personnel costs at home and abroad, international remuneration systems, reintegration)
Prüfungsleistungen *Type of examination*	Seminar contribution (SC)
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	Lecture, Literature work with basic (E-)literature and (E-)journals, Exercise with application tasks and case studies
Literatur *Bibliography*	M. Armstrong and S. Taylor*, Armstrong's Handbook of Human Resource Management Practice*, 15th ed. London, UK: Kogan Page, 2020. P. J. Dowling, M. Festing, and A. Engle, *International Human Resource Management,* 7th ed. Andover, UK: Cengage Learning EMEA, 2017. V. Pucik, P. Evans, I. Björkman, and S. Morris, *The Global Challenge: International Human Resource Management,* 3rd ed. Chicago, IL, USA: Chicago Business Press, 2016. D. Torrington, L. Hall, S. Taylor, and C. Atkinson, *Human Resource Management,* 11th ed. Harlow, UK: Pearson Education Limited, 2020. Special literature regarding the different topics.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme „Sustainable Resources, Engineering and Management (StREaM)“ (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**		Module no.:	**6.1**
		Semester:	**6 (online)**
		WHS:	**3**
		Credit Points:	**5**
Modulbezeichnung *Module title*	**Renewable Energy Systems II**		
Modulniveau *Module level*	Bachelor programme level		
Modulverantwortliche:r *Module leader*	Prof. Dr.-Ing. Jörg Reuter		
Dozent:in *Teaching personnel*	Prof. Dr.-Ing. Jörg Reuter and other lecturer(s)		
Sprache *Language*	English		
Zuordnung zum Curriculum *Mandatory module or Elective module*	StREaM, Compulsory elective module		
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	2 WHS Lecture 1 WHS Recitation		
Arbeitsaufwand *Student workload*	150 Hrs. Total 45 Hrs. Contact time 105 Hrs. Self-study		
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	See Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)		
Empfohlene Voraussetzungen *Recommended prerequisites*	Module: 3.1 Renewable Energy Systems		
Modulziele/angestrebte Lernergebnisse *Module objectives/ Learning outcomes*	Within this module, students seek the compromise between technology, environment, and costs. Upon completion of this module, students will be able to: - understand and describe principles and functionality of electrical energy generation and grid operation - analyse the differences and problems in comparison to conventional systems - classify and analyse new technologies - operate calculations within electrical energy systems as e.g., energy demand, voltage drop, load and short circuit currents		
Inhalt *Contents*	- Sources of renewable energy - Essentials of thermal power generation - Turbomachinery basics - Solar heating - Heat pumps - Solar thermal power stations - Geothermal power stations - River and tidal power stations - Wind turbines - Biomass - Energy storage (e.g. mechanical, compressed air, thermal)		

Prüfungsleistungen *Type of examination*	Oral examination and Presentation (OE, Pre)
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	Smart Board, Power-Point-Presentations, Videos, Moodle, Script as PDF
Literatur *Bibliography*	M. Kaltschmitt and W. Streicher, *Renewable Energy: Technology, Economics and Environment*. Berlin/ Heidelberg, Germany: Springer, 2007.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme „Sustainable Resources, Engineering and Management (StREaM)“ (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**5.1 or 5.2**
	Semester:	**5**
	WHS:	**2**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**Sustainable Buildings**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Prof. Dr. Claudia Fülle
Dozent:in *Teaching personnel*	Prof. Dr. Claudia Fülle
Sprache *Language*	English
Zuordnung zum Curriculum und Modultyp *Curriculum and Type of module*	StREaM, Compulsory elective module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	2 WHS Lecture
Arbeitsaufwand *Student workload*	150 Hrs. Total 30 Hrs. Contact time 120 Hrs. Self-study
Voraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	See Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	Module(s): 1.2 Fundamentals of Naturals Science 2.2 Ecology, Resources and Sustainable Cities
Modulziele/angestrebte Lernergebnisse *Module objectives/ Learning outcomes*	Upon completion of this module, students will be able to: - understand the main vocabulary concerning the evaluation of building design and building operating with regard to sustainability - analyse and exploit the sustainability assessments made by external experts - apply the main principles of sustainable buildings
Inhalt *Contents*	- Optimisation of heating and cooling demands in buildings - Use of renewable energies in buildings - Life cycle assessment for buildings - National and international building certification systems on sustainability
Prüfungsleistungen *Type of examination*	Written Examination, 60 min (WE60)
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	Lecture, presentation with PowerPoint, working in groups on elementary case studies

Literatur *Bibliography*	S. Kubba, *Handbook of Green Building Design and Construction: LEED, BREEAM, and Green Globes.* Amsterdam, Netherlands: Elsevier, 2017. P. Andrasik, *LEED Lab: A Model for Sustainable Design Education*. London, UK: Routledge, 2021. C. Schittich, *Solar Architecture: Strategies, Visions, Concepts*. Basel, Switzerland: Birkhäuser, 2003.

Magdeburg-Stendal University of Applied Sciences; Departments: Engineering and Industrial Design Water, Environment, Construction and Safety Economics **Bachelor programme „Sustainable Resources, Engineering and Management (StREaM)“ (B. Eng.)** **(Wirtschaftsingenieurwesen und Nachhaltigkeit)**	Module no.:	**5.1 or 5.2**
	Semester:	**5**
	WHS:	**4**
	Credit Points:	**5**

Modulbezeichnung *Module title*	**Sustainable Mobility**
Modulniveau *Module level*	Bachelor programme level
Modulverantwortliche:r *Module leader*	Prof. Dr.-Ing. habil. Przemyslaw Komarnicki
Dozent:in *Teaching personnel*	Prof. Dr.-Ing. Konrad Steindorff, Prof. Dr.-Ing. habil. Przemyslaw Komarnicki
Sprache *Language*	English
Zuordnung zum Curriculum *Mandatory module or Elective module*	StREaM, Compulsory elective module
SWS und Art der Lehrveranstaltung *Weekly hours per semester (WHS) and Type of course*	3 WHS Lecture 1 WHS Recitation
Arbeitsaufwand *Student workload*	150 Hrs. Total 60 Hrs. Contact time 90 Hrs. Self-study
BVoraussetzungen nach Prüfungsordnung *Prerequisites according to examination regulations*	See Official Notices related to the Study and Examination Regulations: Amtliche Bekanntmachungen Studien- und Prüfungsordnung Nr. 21/2021 and 31/2021 (English translation)
Empfohlene Voraussetzungen *Recommended prerequisites*	Module: 3.1 Renewable Energy Systems
Modulziele/angestrebte Lernergebnisse *Module objectives/ Learning outcomes*	Upon completion of this module, students will be able to: - demonstrate an awareness of the range of professional, ethical and legal issues relevant to the global professional environment of their discipline. - have knowledge of the drive variants used today in mobile applications - have gained a deep understanding of these systems. - have in-depth knowledge of the variants currently referred to as "alternative drives" - are able to select and design the optimum drive configuration on the basis of application profiles or specifications
Inhalt *Contents*	- Introduction: critical infrastructures and electric mobility, current trends and challenges onraod, offroad and ontrack - Physical, technical description of the e-vehicle I and II - Methods for the efficiency evaluation of propulsion concepts - Standard cycles (load profiles) for different applications - Thermal engines (potentials and trends) - Alternative fuels (hydrogen, eFuels) - Low-voltage (LV) and high-voltage (HV) electrical systems - Power electronics in electric vehicles - Electric propulsion and hybrid propulsion systems (incl. fuel cells) - Energy and fuel storage (gaseous and liquid fuels, recuperative non-electric storage systems)

	- Mobility system - Business models and standards
Prüfungsleistungen *Type of examination*	Written examination, 90 min (WE90) / Presentation (Pre)
Medieneinsatz und Arbeitsformen *Use of media and Forms of work*	Slides and exercises
Literatur *Bibliography*	P. Komarnicki, P. Lombardi and Z. Styczynski, *Electric Energy Storage Systems: Flexibility Options for Smart Grids*, Berlin Heidelberg, Germany: Springer Verlag, 2017. P. Komarnicki, M. Kranhold and Z. Styczynski, *Sector Coupling - Energy-Sustainable Economy of the Future*, Wiesbaden, Germany: Springer Verlag, 2022. P. Komarnicki, J. Haubrock, and Z. Styczynski, *Elektromobilität und Sektorenkopplung - Infrastruktur- und Systemkomponenten*, 2. Auflage, Berlin Heidelberg, Germany: Springer Verlag, 2020.