Westfälische Hochschule
Gelsenkirchen Bocholt Recklinghausen

Modul Description Part 1

of the study course

„Biometics B.Sc“

Applies to the examination regulations from WS 2021/22

Westphalian University of Applied Sciences

Faculty of Mechanical Engineering

1. Qualification aim and central idea

The programme enables graduates to apply the biomimetic innovation process from a biological model organism to a technical prototype based on a technical problem as well as based on a biological phenomenon. The central topics are lightweight design and sensor technology - structurally and materially. The focuses are chosen in such a way that they meet in the improved product of the generation after next. In terms of that knowledge and method expertise as well as the ability to abstract and gather information are imparted to enable the students to link disciplines. In addition, social skills and personal skills are taught that are necessary to work as a bionics technician with a large number of specialists, to communicate ideas, to manage projects and to align them with boundary conditions.

The focuses ‘lightweight design’ and ‘sensor technology’ address central technological topics that will matter exceedingly in the future in respect to resources and energy efficiency. We expect biomimetics to drive forward innovative and creative solutions that form a unit with present engineering competences in the department. Because of the fundamental role of biomimetics in developing new ideas, we consider the programme as a scientific programme with a Bachelor of Science degree.

2. Curriculum

Semester 1	Semester 2	Semester 3	Semester 4	Semester 5	Semester 6
Mathematics I	Mathematics II	Fundamentals of electrical engineering I	Finite Element Method	Physics	Term Project + Internship + Bachelor Thesis
Biology and biomimetics I	Biology and biomimetics II	Biology and biomimetics III	Biology and biomimetics IV	English for Scientific Academic	
Technical mechanics I	Technical mechanics II	Computer Science	Lightweight Design I	Lightweight Design II	
Fundamentals of materials science I	Material sciences for biomimetics	Computer Aided Design	Machine Elements	Biomimetic Sensor Technology II	
Chemistry I	Chemistry II	Elective Module I	Biomimetic Sensor Technology I	Elective Module II	

3. Module Descriptions

All modules are described in the document "Module Handbook Part 2" (page 6).

Attachements

- exam offer
- study plan

Organisation of the exams

Biomimetics B.Sc

Valid from WS 21/22

					exam period			
					End -WS	Start -SS	End -SS	Start -WS
Nr	subject designation	Sem.	Abbreviation	WS/SS	Jan/Feb	March	July	Sept
1	Mathematics I	1	MAT1	WS	x	x	-	x
2	Biology an biomimetics	1	BIO1	WS	x	x	-	x
3	Technical mechanics I	1	TME1	WS	x	x	-	x
4	Fundamentals of materials science I	1	GWK1	WS	x	x	-	x
5	Chemistry I	1	BCH1	WS	x	x	-	x
6	Mathematics II	2	MAT2	SS	-	x	x	x
7	Biology and biomimetics II	2	BIO2	SS	-	x	x	x
8	Technical mechanics II	2	TME2	SS	-	x	x	x
9	Material sciences for biomimetics	2	BWK	SS	-	x	x	x
10	Chemistry II	2	BCH2	SS	-	x	x	x
11	Fundamentals of electrical engineering I	3	GET1	WS	x	x	-	x
12	Biology and biomimetics III	3	BIO3	WS	x	x	-	x
13	Computer Science	3	BIN	WS	x	x	-	x
14	Computer Aided Design	3	CAD	WS	x	x	-	x
15	Elective Module I	3	WMB1	WS	x	x	-	-
16	Finite Element Method	4	FEM	SS	-	x	x	x
17	Biology and biomimetics IV	4	BIO4	SS	-	x	x	x
18	Lightweight Design I	4	BLB1	SS	-	x	x	x
19	Machine Elements	4	MEL	SS	-	x	x	x
20	Biomimetic Sensor Technology I	4	BSE1	SS	-	x	x	x
21	Physics	5	BPY	WS	x	x	x	-
22	English for Scientific Academic Purposes	5	BEN	WS	x	x	x	-
23	Lightweight Design II	5	BLB2	WS	x	x	x	-
24	Biomimetic Sensor Technology II	5	BSE2	WS	x	x	x	-
25	Elective Module 5. Sem. Bachelor	5	WMB2	WS	x	x	-	-
26	Term Project	6	PRJ	SS	according to the arrangement			
27	Bachelor Thesis	6	BA	SS				

Study plan

Biometics B.Sc -study plan				1. Semester			2. Semester			3. Semester			4. Semester			5. Semester			6. Semester		
	Modul	Prof.	CP	V	Ü	P	V	Ü	P	V	Ü	P	V	Ü	P	V	Ü	P	V	Ü	P
MAT1	Mathematics I	Kiel	6	3	1	0															
BIO1	Biology an biomimetics	Bei	6	3	0	1															
TME1	Technical mechanics I	Maß	6	2	2	0															
GWK1	Fundamentals of materials science I	Iba	6	3	0	1															
BCH1	Chemistry I	Spr	6	2	0	2															
MAT2	Mathematics II	Kiel	6				2	2	0												
BIO2	Biology and biomimetics II	Bei	6				3	0	1												
TME2	Technical mechanics II	Pei	6				2	1	1												
BWK	Material sciences for biomimetics	Spr	6				2	0	2												
BCH2	Chemistry II	Spr	6				2	0	2												
GET1	Fundamentals of electrical engineering I	Too	6							4	0	0									
BIO3	Biology and biomimetics III	Sei	6							3	0	1									
BIN	Computer Science	Kiel	6							3	0	1									
CAD	Computer Aided Design	Wen	6							3	0	1									
WMB1	Elective Module I	alle	6							4	0	0									
FEM	Finite Element Method	Sauer	6										2	0	2						
BIO4	Biology and biomimetics IV	Bei	6										2	0	2						
BLB1	Lightweight Design I	Sauer	6										2	0	2						
MEL	Machine Elements	Seil	6										2	0	2						
BSE1	Biomimetic Sensor Technology I	Sei	6										2	0	2						
BPY	Physics	Maß	6													2	0	2			
BEN	English for Scientific Academic Purposes	SPZ	6													0	4	0			
BLB2	Lightweight Design II	Sauer	6													2	0	2			
BSE2	Biomimetic Sensor Technology II	Sei	6													2	0	2			
WMB2	Elective Module 2 Bachelor	all	6													4	0	0			
BA	Bachelor Thesis	all	12																		
PRX	Internship	all	12																		
PRJ	Term Project	all	6																		

valid for the examination regulations from WS 2021/22

Dual version

Biometics B.Sc -study plan dual				1. Semester			2. Semester			3. Semester			4. Semester			5. Semester			6. Semester				
	Modul	Prof.	CP	V	Ü	P	V	Ü	P	V	Ü	P	V	Ü	P	V	Ü	P	V	Ü	P	V	Ü	P	BA
MAT1	Mathematics I	Kiel	6	3	1	0																		
BIO1	Biology an biomimetics	Bei	6	3	0	1																		
TME1	Technical mechanics I	Maß	6							2	2	0												
GWK1	Fundamentals of materials science I	Iba	6							3	0	1												
BCH1	Chemistry I	Spr	6	2	0	2																		
MAT2	Mathematics II	Kiel	6				2	2	0															
BIO2	Biology and biomimetics II	Bei	6				3	0	1															
TME2	Technical mechanics II	Pei	6										2	1	1									
BWK	Material sciences for biomimetics	Spr	6										2	0	2									
BCH2	Chemistry II	Spr	6				2	0	2															
GET1	Fundamentals of electrical engineering I	Too	6													4	0	0						
BIO3	Biology and biomimetics III	Sei	6													3	0	1						
BIN	Computer Science	Kiel	6													3	0	1						
CAD	Computer Aided Design	Wen	6													3	0	1						
WMB1	Elective Module I	alle	6													4	0	0						
FEM	Finite Element Method	Sauer	6																2	0	2			
BIO4	Biology and biomimetics IV	Bei	6																2	0	2			
BLB1	Lightweight Design I	Sauer	6																2	0	2			
MEL	Machine Elements	Seil	6																3	0	1			
BSE1	Biomimetic Sensor Technology I	Sei	6																2	0	2			
BPY	Physics	Maß	6																			2	0	2	
BEN	English for Scientific Academic Purposes	SPZ	6																			0	4	0	
BLB2	Lightweight Design II	Sauer	6																			2	0	2	
BSE2	Biomimetic Sensor Technology II	Sei	6																			2	0	2	
WMB2	Elective Module 2 Bachelor	all	6																			4	0	0	
BA	Bachelor Thesis		12																						BA
PRX	Internship		12																						PRX
PRJ	Term Project		6																						PRJ

valid for the examination regulations from WS 2021/22

Modul Description Part 2

Contents

1 Compulsory modules

1.1 Final Project

Final Project						
Code:	BA	Workload:	360 hrs	ECTS credits:	12	
Semester:	6	Duration:	1 semester	Frequency:	As required	
Teaching events					Attendance Time	Self-study
Bachelor thesis						360 hrs
Forms of teaching						
Bachelor thesis						
Group size						
Individual or group work						
Objectives						
The bachelor thesis should show that the student is able to complete a practice-oriented task in his/her field of specialization, within a given time, working independently on technical details and interdisciplinary context, according to scientific and practical methods.						
Contents						
as per examination regulations						
Use of the module						
Compulsory module of the Bachelor of Mechatronics degree Compulsory module of the Bachelor of Biomimetics degree Compulsory module of the Bachelor of Industrial Engineering degree						
Prerequisites						
135 ECTS credits						
Type of Examination						
Written thesis						
Requirements for award of ECTS points						
Successfully composing the thesis						
Importance of the grade of the module to the final score						
According to the examination regulations						
Lecturer						
All Professors of the department						
Module coordinator						
All Professors of the department						
Additional information						

1.2 Biology and biomimetics I

Biology and biomimetics I						
Code:	BIO1	Workload:	180 hrs	ECTS credits:	6	
Semester:	1	Duration:	1 semester	Frequency:	Every winter semester	
Teaching events					Attendance Time	Self-study
Lecture: 3 hours per semester week					45 hrs	90 hrs
Practical Training: 1 hour per semester week					15 hrs	30 hrs
Forms of teaching						
Lecture, Practical Training						
Group size						
Lecture: Limited as per notice Practical Training: 15						
Objectives						
The students have a profound overview of the basics of general biology, zoology and biomimetics. They have in-depth knowledge of the structural plans of selected taxonomic groups of animal kingdom. They work specifically on functional properties of zoological tissues and structures. They master adequate methods such as microscopy (reflected and transmitted light) and preparation and are able to use scientific drawings and recordings to present the results in a target-oriented manner. Research, processing and text development of potentially technologically relevant biological mechanisms can be carried out independently.						
Objectives						
Lecture: Zoology, cell biology, macromolecules, vesicle theory, cell membrane, endosymbiont hypothesis, cell organelles, neurobiology, chemical and electrical information transfer, phylogeny of the construction plans and systematics of selected groups of the Protozoa and Metazoa, evolution, theory of light microscopy, introduction to biomimetics and current examples of biomimetics. Practical training: Microscopy of finished preparations, preparation of fresh and fixated objects, animal cells, functional animal tissues, transmitted and reflected light microscopy, scientific drawing, functional morphology and anatomy of the object.						
Use of the module						
Compulsory module of the Bachelor of Biomimetics degree						
Prerequisites						
None						
Type of Examination						
Written examination, written composition						
Requirements for award of ECTS points						
Passing the examination and the practical training						
Importance of the grade of the module to the final score						
According to the examination regulations						
Lecturer						
Prof. Dr. H. Beismann						
Module coordinator						
Prof. Dr. H. Beismann						
Additional information						
Literature: Wehner R, Gehring, W (2007): Zoologie. (24th ed.), Thieme Verlag, Stuttgart. Storch V, Welsch U (2009): Kükenthal Zoologisches Praktikum. (26th ed.), SpektrumAkademischer Verlag, Heidelberg. Sadava D, Hillis DM, Heller HC, Berenbaum MR (2011): Purves Biologie, (9th ed.), Spektrum Akademischer Verlag, Heidelberg. Language: German						

1.3 Biology and biomimetics II

Biology and biomimetics II						
Code:	BIO2	Workload:	180 hrs	ECTS credits	6	
Semester:	2	Duration:	1 semester	Frequency:	Every summer semester	
Teaching events					Attendance Time	Self-study
Lecture: 3 hours per semester week					45 hrs	90 hrs
Practical Training: 1 hour per semester week					15 hrs	30 hrs
Forms of teaching						
Lecture, Practical Training						
Group size						
Lecture: Limited as per notice Practical Training: 15						
Objectives						
The students have a profound overview of the basics of general biology, botany and biomimetics. In particular, they have in-depth knowledge of the construction plans of selected taxonomic groups of the plant kingdom. They specifically work on the functional properties of plant tissues and structures. They master adequate methods such as microscopy (reflected and transmitted light), advanced preparation science and staining techniques, and are able to use scientific drawings and protocol writing to present the results in a target-oriented way. Research, processing and text development of potentially technologically relevant biological mechanisms can be carried out independently.						
Contents						
Lecture: Botany, morphology, anatomy, functional structures and systematics of plants, tissue types and their function, plant construction principles and functional morphology, functional surfaces, movement in the plant kingdom, Biomechanics. Current and historical examples of biomimetics from relevant subject areas. Practical training: Microscopy of finished preparations, preparation of fresh and fixed objects, staining techniques, photography, plant cells, functional plant tissues, structures and materials, biomechanics of plant structures.						
Use of the module						
Compulsory module of the Bachelor of Biomimetics degree						
Prerequisites						
Contents from BIO1						
Type of Examination						
Written examination, written composition						
Requirements for award of ECTS points						
Passing the examination and the practical training						
Importance of the grade of the module to the final score						
According to the examination regulations						
Lecturer						
Prof. Dr. H. Beismann						
Module coordinator						
Prof. Dr. H. Beismann						
Additional information						
Literature: Nultsch W (2001): Botanik. (11th ed.), Thieme Verlag, Stuttgart. (Lecture) Bresinsky A, Körner C, Kadereit JW, Neuhaus G, Sonnewald U (2008): Strasburger Lehrbuch der Botanik. Spektrum Akademischer Verlag, (36th ed.). (Intesification) Wanner G, Nultsch W (2004): Mikroskopisch-Botanisches Praktikum für Anfänger, Thieme Stuttgart. (Practical Training) Schmeil O, Fitschen J, Seybold S (2009): Flora von Deutschland und angrenzender Länder. Ein Buch zum Bestimmen der wild wachsenden und häufig kultivierten Gefässpflanzen. (94th ed.) Wiebelsheim: Quelle & Meyer Language: German						

1.4 Biology and biomimetics III

Biology and biomimetics III						
Code:	BIO3	Workload:	180 hrs	ECTS credits:	6	
Semester:	3	Duration:	1 semester	Frequency:	Every winter semester	
Teaching events					Attendance Time	Self-study
Lecture: 3 hours per semester week					45 hrs	90 hrs
Practical Training: 1 hour per semester week					15 hrs	30 hrs
Forms of teaching						
Lecture, Practical Training						
Group size						
Lecture: Limited as per notice Practical Training: 15						
Objectives						
The participants will learn to describe the working principles of biological systems (senses, locomotion) and to experimentally analyse biological systems to be enabled to conduct scientific experiments. This includes the methodological skills of recording, presenting and interpreting data, implementing guidelines on ethics and safety, and independently drawing up scientific protocols.						
Contents						
Contents: - Basics: Membranes, resting potential, action potential, neuronal systems - Seeing: Evolution of visual systems, functional anatomy and image formation in vertebrate and invertebrate eyes, accommodation, lateral inhibition, occulomotor reflex, elementary motion detectors, - Mechanosensors: human sense of touch, tactile and mechanical senses in invertebrates, hearing, directional hearing, coincidence detection, frequency analysis, lateral line organ in fish - Selected aspects of chemosensors, infrared, thermosensors, electro- and magnetosensors, nociception - Muscle and skeletal systems, locomotion modes: inverse pendulum and feather-mass system, movements in the plant kingdom, turgor, nastia, tropisms - Mechanisms of learning and memory - Getting to know neuroethological basics and model organisms and, using navigation as an example, the interaction of biological sensory and movement systems in behaviour,						
Use of the module						
Compulsory module of the Bachelor of Biomimetics degree						
Prerequisites						
Participation in the practical training of BIO1 and BIO2						
Type of Examination						
Written examination, written composition						
Requirements for award of ECTS points						
Passing the examination and the practical training						
Importance of the grade of the module to the final score						
According to the examination regulations						
Lecturer						
Prof. Dr. T. Seidl						
Module coordinator						
Prof. Dr. T. Seidl						
Additional information						
The current literature will be announced by the lecturer at the beginning of the module. Language: German						

1.5 Biology and biomimetics IV

Biology and biomimetics IV						
Code:	BIO4	Workload:	180 hrs	ECTS credits:	6	
Semester:	4	Duration:	1 semester	Frequency:	Every summer semester	
Teaching events					Attendance Time	Self-study
Lecture: 2 hours per semester week					30 hrs	60 hrs
Practical Training: 2 hours per semester week					30 hrs	60 hrs
Forms of teaching						
Lecture, Practical Training						
Group size						
Lecture: Limited as per notice Practical Training: 15						
Objectives						
The students are able to carry out independent, application-oriented biomimetic projects. They design biomimetic concepts and designing a biomimetic product while showing all necessary "soft skills". They present the results in a target oriented manner.						
Contents						
Lecture and Practical Training: Examples of biomimetic projects from industry and research. Problem solving using creativity techniques, biomimetic innovation processes, analogy formation, morphological box, communication, project management, social skills: teamwork, responsibility, self-competence: dealing with time pressure, work organisation, professional boundaries.						
Use of the module						
Compulsory module of the Bachelor of Biomimetics degree						
Prerequisites						
Contents from BIO1, BIO2, BIO3						
Type of Examination						
Written examination, presentation, written composition						
Requirements for award of ECTS points						
Passing the examination and the practical training						
Importance of the grade of the module to the final score						
According to the examination regulations						
Lecturer						
Prof. Dr. H. Beismann						
Module coordinator						
Prof. Dr. H. Beismann						
Additional information						
The current literature will be announced by the lecturer at the beginning of the module. Language: German						

1.6 Biomimetics sensor system I

Biomimetic sensor systems I						
Code:	BSE1	Workload:	180 hrs	ECTS credits:	6	
Semester:	4	Duration:	1 semester	Frequency:	Every summer semester	
Teaching events					Attendance Time	Self-study
Lecture: 2 hours per semester week					30 hrs	60 hrs
Practical Training: 2 hours per semester week					30 hrs	60 hrs
Forms of teaching						
Lecture, Practical Training						
Group size						
Lecture: Limited as per notice Practical Training: 15						
Objectives						
The participants learn independently scientific experiments using biological, technical and bionic models to design and implement and to implement theoretical concepts in a technical structure and later interdisciplinary being able to work on projects in the fields of biomechanics, bionics, neuroethology, biorobotics.						
Contents						
- Applying methods of measurement technology, data acquisition, processing and filtering and thus recording and analysing sensor data - Uni- and multivariate descriptive and inductive statistics - Electronic data recording and processing - Effective principles of technical and biomimetic sensor principles - Developing hypotheses and deriving experimental approaches from them - Behavioural experiments on living organisms - Technical basics of mobile robots						
Use of the module						
Compulsory module of the Bachelor of Biomimetics degree						
Prerequisites						
Participation in the Practical Training of Physics, BIN, BIO3						
Type of Examination						
Written examination						
Requirements for award of ECTS points						
Passing the examination and the practical training						
Importance of the grade of the module to the final score						
According to the examination regulations						
Lecturer						
Prof. Dr. T. Seidl						
Module coordinator						
Prof. Dr. T. Seidl						
Additional information						
The current literature will be announced by the lecturer at the beginning of the module. Language: German						

1.7 Biomimetics sensor system II

Biomimetic sensor systems II						
Code:	BSE2	Workload:	180 hrs	ECTS credits:	6	
Semester:	5	Duration:	1 semester	Frequency:	Every winter semester	
Teaching events					Attendance Time	Self-study
Lecture: 2 hours per semester week					30 hrs	60 hrs
Practical Training: 2 hours per semester week					30 hrs	60 hrs
Forms of teaching						
Lecture, Practical Training						
Group size						
Lecture: Limited as per notice Practical Training: 15						
Objectives						
The participants learn to independently carry out biomimetic innovation projects with a scientific background in order to later be able to carry out technical/scientific innovation projects of their own responsibility in a leading role.						
Contents						
- Group work with open task, independent familiarization and development of solution concepts - Generation of scientific backed solutions using the biomimetic process (top-down/bottom-up) - Developing and carrying out central elements of project management (project types, project structures, planning methods, submission of applications) - Written documentation and public presentation - Biorobotics history, definition, objectives and selected model organisms - Biorobotic concepts for locomotion on land, in water and in air - Control architectures, embodiment, situatedness, adaptivity - Modelling of experimental findings using artificial neural networks - Swarm behaviour, stigmergy, self-organisation						
Use of the module						
Compulsory module of the Bachelor of Biomimetics degree						
Prerequisites						
Contents from BSE1						
Type of Examination						
Oral examination						
Requirements for award of ECTS points						
Passing the examination and the practical training						
Importance of the grade of the module to the final score						
According to the examination regulations						
Lecturer						
Prof. Dr. T. Seidl						
Module coordinator						
Prof. Dr. T. Seidl						
Additional information						
The current literature will be announced by the lecturer at the beginning of the module. Language: German						

1.8 Chemistry I

Chemistry I						
Code:	BCH1	Workload:	180 hrs	ECTS credits:	6	
Semester:	1	Duration:	1 semester	Frequency:	Every winter semester	
Teaching events					Attendance Time	Self-study
Lecture: 2 hours per semester week					30 hrs	60 hrs
Practical Training: 2 hours per semester week					30 hrs	60 hrs
Forms of teaching						
Lecture, Practical Training						
Group size						
Lecture: Limited as per notice Practical Training: 15						
Objectives						
The students can assess the properties of compounds, describe redox processes, determine pH values and trace changes in the organism. The knowledge of the processes enables the students to understand and evaluate corrosion processes of different materials.						
Contents						
Lecture: Structure of matter, properties of the elements, structure of the periodic table, separation methods in chemistry, acid/base titration, preparation of buffer solutions, redox chemistry, analytical methods Practical training: General working techniques in chemical laboratories, separation methods, determination of physical constants, pH-value determination, acid-base titration, preparation of buffer solutions, redox processes, analytical methods						
Use of the module						
Compulsory module of the Bachelor of Biomimetics degree						
Compulsory module of Sustainable Engineering and Management						
Prerequisites						
None						
Type of Examination						
Written examination						
Requirements for award of ECTS points						
Passing the examination and the practical training						
Importance of the grade of the module to the final score						
According to the examination regulations						
Lecturer						
Prof. Dr. A. Springer						
Module coordinator						
Prof. Dr. A. Springer						
Additional information						
The current literature will be announced by the lecturer at the beginning of the module. Language: German						

1.9 Chemistry II

Chemistry II						
Code:	BCH2	Workload:	180 hrs	ECTS credits:	6	
Semester:	2	Duration:	1 semester	Frequency:	Every summer semester	
Teaching events					Attendance Time	Self-study
Lecture: 2 hours per semester week					30 hrs	60 hrs
Practical Training: 2 hours per semester week					30 hrs	60 hrs
Forms of teaching						
Lecture, Practical Training						
Group size						
Lecture: Limited as per notice Practical Training: 15						
Objectives						
The students can understand reactions of macromolecules (especially polymerization reactions) by applying the acquired knowledge in the field of reactions of organic compounds.						
Contents						
Lecture: Basics of organic chemistry: construction, structure and application of hydrocarbons, alcohols, lipids, carbohydrates and proteins. Production, reactions and properties of polymers. Practical Training: Experiments for the differentiation of different functional groups, photometric determination of content, preparation and investigation of polymeric compounds						
Use of the module						
Compulsory module of the Bachelor of Biomimetics degree						
Prerequisites						
Contents from BCH1						
Type of Examination						
Written examination of BCH1 and BCH2 combined						
Requirements for award of ECTS points						
Passing the examination and the practical training						
Importance of the grade of the module to the final score						
According to the examination regulations						
Lecturer						
Prof. Dr. A. Springer						
Module coordinator						
Prof. Dr. A. Springer						
Additional information						
The current literature will be announced by the lecturer at the beginning of the module. Language: German						

1.10 Computer Aided Design

Computer Aided Design						
Code:	CAD	Workload:	180 hrs	ECTS credits:	6	
Semester:	3	Duration:	1 semester	Frequency:	Every winter semester	
Teaching events					Attendance Time	Self-study
Lecture: 3 hours per semester week					45 hrs	90 hrs
Practical Training: 1 hour per semester week					15 hrs	30 hrs
Forms of teaching						
Lecture, Practical Training						
Group size						
Lecture: Limited as per notice Practical Training: 15						
Objectives						
The students can construct simple components, roughly dimension them and depict them using hand sketches or the CAD system. The students can read and create technical drawings, draw components in accordance with standards and ready for production						
Contents						
-Introduction to technical drawing, projection methods, sections, hatching and dimensioning -Creation of hand sketches and standard-compliant technical drawings -Apply a manufacturable dimension for selected processes -Selection and calculation of tolerances and fits -Knowledge of the function, use and representation of elementary machine elements -Modeling of components and assemblies using CAD software -Deriving technical drawings from CAD models						
Use of the module						
Compulsory module of the Bachelor of Mechanical Engineering degree Compulsory module of the Bachelor of Biomimetics degree Compulsory module of the Bachelor of Industrial Engineering degree Compulsory module of the Bachelor of Mechatronics degree Compulsory module of the Bachelor of Robotics and Automation degree Compulsory module of the Bachelor of Sustainable Engineering and Management degree						
Prerequisites						
Contents: Technical Mechanics I, Fundamentals of material science I or material science						
Type of Examination						
Written examination						
Requirements for award of ECTS points						
Passing the examination						
Importance of the grade of the module to the final score						
According to the examination regulations						
Lecturer						
Prof. Dr. M. Wendland						
Module coordinator						
Prof. Dr. M. Wendland						
Additional information						
The current literature will be announced by the lecturer at the beginning of the module. Language: German						

1.11 English for Scientific Academic Purposes

English for Scientific Academic Purposes						
Code:	BEN	Workload:	180 hrs	ECTS credits:	6	
Semester:	3,5	Duration:	1 semester	Frequency:	Every winter semester	
Teaching events					Attendance Time	Self-study
4 hours per semester week: face-to-face tuition and guided self-study (possibly in the multimedia laboratory)					60 hrs	120 hrs
Forms of teaching						
Seminar						
Group size						
30						
Objectives						
English discourse- and performance-competences in the field of biomimetics, in particular with regards to the customs of Anglo-American scientific communication.						
Contents						
Technical English language aspects from the following areas: - Description of technical-scientific processes and procedures - Language of formulas, symbols, technical drawings and diagrams - Source work: citation standards, excerpts, bibliographies - Indexing and summarizing scientific texts - Presentation and disputation of scientific topics - Receptive and productive examination of typical situations within professional communication						
Use of the module						
Compulsory module of the Bachelor of Biomimetics degree						
Prerequisites						
Advanced English language skills corresponding to the university entrance qualification						
Type of Examination						
Written examination						
Requirements for award of ECTS points						
Passing the examination						
Importance of the grade of the module to the final score						
In accordance with the examination regulations						
Lecturer						
Dr. Thorsten Winkelräth, Bernd Winkelräth et al.						
Module coordinator						
Dr. P. Iking						
Additional information						
Recommended reading material will be announced by the teaching stuff at the beginning of the course. Self-study resources in the MultiMedia Laboratory of the Language Centre Language: English						

1.12 Finite Element Method

Finite Element Method						
Code:	FEM	Workload:	180 hrs	ECTS credits:	6	
Semester:	4	Duration:	1 semester	Frequency:	Every summer semester	
Teaching events					Attendance Time	Self-study
Lecture: 2 hours per semester week					30 hrs	60 hrs
practical course: 2 hours per semester week					30 hrs	60 hrs
Forms of teaching						
Lecture, practical course						
Group size						
Lecture: Limited as per notice practical course: 15						
Objectives						
The students recognize the basic idea of FEM and can explain and apply the principle of modelling. In the practical part of the course, they will be able to carry out a computer simulation of the strength of various carry out components in a structured and independent manner, critically interpret the results and then evaluate them						
Contents						
Lecture: Basic principle of FEM, general approach (pre- and post-processing, solver), areas of application, short introduction to the mathematical and mechanical basics.Verification and validation of the FE results practical course: Strength/stiffness and modal analyses of components with linear-elastic approaches, use and application of a professional FEM software pre-processing: element selection, meshing, definition of boundary conditions, Solution: Use of different solvers Post-processing: discussion / evaluation of results and documentation						
Use of the module						
Compulsory module of the Bachelor of Mechatronics degree Compulsory module of the Bachelor of Biomimetics degree						
Prerequisites						
Technical mechanics I/II, Computer Aided Design						
Type of Examination						
examination: performing an FE-simulation on the computer						
Requirements for award of ECTS points						
Passing the examination and the practical course						
Importance of the grade of the module to the final score						
According to the examination regulations						
Lecturer						
Prof. Dr. A. Sauer						
Module coordinator						
Prof. Dr. A. Sauer						
Additional information						
Recommended reading material will be announced by the lecturer at the beginning of the course. Language: German						

1.13 Fundamentals of electrical engineering I

Fundamentals of electrical engineering I						
Code:	GET1	Workload:	180 hrs	ECTS credits:	6	
Semester:	1, 3	Duration:	1 semester	Frequency:	Every winter semester	
Teaching events					Attendance Time	Self-study
Lecture: 4 hours per semester week					60 hrs	120 hrs
Forms of teaching						
Lecture						
Group size						
Lecture: Limited as per notice						
Objectives						
Participants will be able to analyse and design simple DC and AC networks consisting of linear electrical components. They master the methods and tools of network analysis (algebraic methods, differential equations and complex alternating current calculations) in order to be able to apply and expand them in advanced modules and specialist areas (computer engineering, energy and drive technology, electronics and sensor technology, measurement and control technology).						
Contents						
Linear components (R,L,C), Ohm's law, Kirchhoff's laws, current and voltage dividers, Wheatstone's bridge, power matching, basics of field theory, RLC switch-on processes, complex pointers, impedance, apparent, active and reactive power, reactive power compensation, three-phase current, power and energy balances.						
Use of the module						
Compulsory module of the Bachelor of Mechanical Engineering degree Compulsory module of the Bachelor of Biomimetics degree Compulsory module of the Bachelor of Mechatronics degree Compulsory module of the Bachelor of Robotics and Automation degree						
Prerequisites						
None						
Type of Examination						
Written examination						
Requirements for award of ECTS points						
Passing the examination						
Importance of the grade of the module to the final score						
According to the examination regulations						
Lecturer						
Prof. Dr. H. Toonen						
Module coordinator						
Prof. Dr. H. Toonen						
Additional information						
Literature: Wilfried Weißgerber: "Elektrotechnik für Ingenieure 1", Springer Verlag, ISBN 978-3-8348-0903-2; Frohne, Löcherer, Müller, Moeller: "Grundlagen der Elektrotechnik", Teubner Verlag, ISBN 3-519-56400-9, Online: Script of lecture, collection of excercises, formulary, examinations Language: German						

1.14 Fundamentals of material science I

Fundamentals of material science I						
Code:	GWK 1	Workload:	180 h	ECTS credits:	6	
Semester:	1	Duration:	1 semester	Frequency:	Every winter semester	
Teaching events					Attendance Time	Self-study
Lecture: 3 hours per semester week					45 hrs	90 hrs
Practical Training: 1 hour per semester week					15 hrs	30 hrs
Forms of teaching						
Lecture, Practical Training						
Group size						
Lecture: Limited as per notice Practical Training: 15						
Objectives						
Starting from the structure of the materials, the participants can understand and interpret the usage and production properties of materials by knowing the structure of crystalline materials, bonding types, phase transformations, thermally activated processes, basics of alloy formation, state diagrams, time-temperature transformation diagrams, heat treatments, selected mechanical-technological material tests (hardness testing), being able to understand and apply the designation and classification of the materials, knowing the essential iron-based materials (steel, cast steel, cast iron), in order to later apply the skills to other fields of study (production engineering, design engineering) and to make a suitable material selection for use in mechanical and plant engineering.						
Contents						
Lecture: Structure of crystalline materials, bonding types, phase transformations, thermally activated processes, principles of alloy formation, state diagrams (equilibria), TTT diagrams (imbalances), heat treatments, designation and classification of materials, iron-based materials (steel, cast steel, cast iron) Practical Training: Structure formation processes: Equilibria and state diagrams, metallography, TTT diagrams						
Use of the module						
Compulsory module of the Bachelor of Mechanical Engineering degree Compulsory module of the Bachelor of Biomimetics degree Compulsory module of the Bachelor of Mechatronics degree						
Prerequisites						
School knowledge in chemistry and physics						
Type of Examination						
Oral examination						
Requirements for award of ECTS points						
Passing the examination						
Importance of the grade of the module to the final score						
According to the examination regulations						
Lecturer						
Prof. Dr. A. Ibach						
Module coordinator						
Prof. Dr. A. Ibach						
Additional information						
Teaching materials and literature - A. Ibach: Script of lecture "GWK1", Questions for self-monitoring - H.-J. Bargel, G. Schulze: Werkstoffkunde, (12th ed.) (2018), Springer Verlag. - J. Reissner: Werkstoffkunde für Bachelors, Carl Hanser Verlag, 2010 (150 Lernziele) - E. Ignatowitz: Werkstofftechnik für Metallbauberufe, Verlag Europa-Lehrmittel, 2019 (6. Auflage) - W. Theisen, H. Berns: Eisenwerkstoffe - Stahl und Gusseisen, Springer-Verlag, 2008 (4. Auflage) Language: German						

1.15 Computer Science

Computer Science						
Code:	BIN	Workload:	180 hrs	ECTS credits:	6	
Semester:	3	Duration:	1 semester	Frequency:	Every winter semester	
Teaching events					Attendance Time	Self-study
Lecture: 3 hours per semester week					45 hrs	90 hrs
practical course: 1 hour per semester week					15 hrs	30 hrs
Forms of teaching						
Lecture, practical course						
Group size						
Lecture: Limited as per notice practical course: 15						
Objectives						
Participants will be able to analyse and design simple computer programs and microcontroller applications by analysing and developing algorithms and data structures. Being proficient in the concept of procedural and object-oriented high-level programming languages, they will be able to retrieve data from sensors and control actuators with a microcontroller, enabling implementation of own control systems using microcontrollers in the future.						
Contents						
Lecture: computer structures, architectures, algorithms and data structures, functions, declarations, definitions fundamentals of programming, structured analysis, management of requirements, software testing, software documentation version management, backup systems practical course: Control and evaluation of electronic actuators and sensors practical implementation of a measurement setup						
Use of the module						
Compulsory module of the Bachelor of Biomimetics degree Compulsory module of the Bachelor of Sustainable Engineering and Management degree						
Prerequisites						
None						
Type of Examination						
Written examination						
Requirements for award of ECTS points						
Passing the examination and the practical course						
Importance of the grade of the module to the final score						
According to the examination regulations						
Lecturer						
Prof. Dr. H. Kiel						
Module coordinator						
Prof. Dr. H. Kiel						
Additional information						
Recommended reading material will be announced by the lecturer at the beginning of the course. Language: German						

1.16 Lightweight Design I

Lightweight Design 1						
Code:	BLB1	Workload:	180 hrs	ECTS credits:	6	
Semester:	4	Duration:	1 semester	Frequency:	Every summer semester	
Teaching events					Attendance Time	Self-study
Lecture: 2 hours per semester week					30 hrs	60 hrs
Practical Training: 2 hours per semester week					30 hrs	60 hrs
Qualification Goals						
Lecture, Practical Training						
Group size						
Lecture: Limited as per notice Practical Training: 15						
Objectives						
The students can dimension lightweight structures with the aids of classic lightweight construction in a weight-optimized manner						
Contents						
Types of lightweight design (conceptual- shape-, conditional-, material- and manufacturing-lightweight design) - Truss - Bending of thin-walled, open and full profile bars - Thrust of thin-walled, open and full profile bars - Torsion of thin-walled, open and full profile bars - Torsion of compact bodies - Sandwich elements - Reasons for and against lightweight construction measures Practical course: The students construct, build and test lightweight structures in teams (e.g. model glider and truss- , bend- and torsion-structures)						
Use of the module						
Compulsory module of the Bachelor of Biomimetics degree						
Prerequisites						
Contents from TME1, GWK1						
Type of Examination						
Written examination						
Requirements for award of ECTS points						
Passing the examination and practical training						
Importance of the grade of the module to the final score						
According to the examination regulations						
Lecturer						
Prof. Dr. A. Sauer						
Module coordinator						
Prof. Dr. A. Sauer						
Additional information						
Literature: B. Klein: Leichtbau-Konstruktion - Berechnungsgrundlagen und Gestaltung, Springer-Verlag Language: German						

1.17 Lightwweight Design II

Lightweight Design 2						
Code:	BLB2	Workload:	180 hrs	ECTS credits:	6	
Semester:	5	Duration:	1 semester	Frequency:	Every winter semester	
Teaching events					Attendance Time	Self-study
Lecture: 2 hours per semester week					30 hrs	60 hrs
Tutorial: 2 hours per semester week					30 hrs	60 hrs
Forms of teaching						
Lecture, Practical Training						
Group size						
Lecture: Limited as per notice Practical Training: 15						
Objectives						
The students learn to independently carry out biomimetic lightweight design projects with an engineering background. Starting with a biological model, students are able to abstract, evaluate and adjust mechanical structures for technical applications in a proper functional manner. Scaling and growth laws are applied. Subsequent structure optimizations are conducted and findings critically evaluated. Based on the fundamentals of fibre-reinforced plastics (FRP), students can assess a meaningful use of FRP in technical products.						
Contents						
- Optimization methods with stochastic, heuristic and mathematical approach - Topology-, shape-, sizing- and material-optimization - Commercial and free optimization programs, as well as graphical methods (tensile triangles, force-cone method,...) - Scaling and growth laws - FRP raw materials resin and fibres - Classical laminate theory - FRP failure modes - Overview of FRP manufacturing processes Practical course: The students develop a lightweight structure as part of a team project. It will be designed, manufactured and the results will be documented.						
Use of the module						
Compulsory module of the Bachelor of Biomimetics degree						
Prerequisites						
Contents from TME1, GWK1						
Type of Examination						
Oral examination						
Requirements for award of ECTS points						
Passing the examination and Practical Training						
Importance of the grade of the module to the final score						
According to the examination regulations						
Lecturer						
Prof. Dr. A. Sauer						
Module coordinator						
Prof. Dr. A. Sauer						
Additional information						
Literature: A. Sauer: Bionik in der Strukturoptimierung - Praxishandbuch für ressourceneffizienten Leichtbau, Vogel-Fachbuchverlag C. Mattheck: Die Körpersprache der Bauteile, KIT-Verlag Language: German						

1.18 Machine Elements

Machine Elements						
Code:	MEL	Workload:	180 hrs	ECTS credits:	6	
Semester:	4	Duration:	1 semester	Frequency:	Every summer semester	
Teaching events					Attendance Time	Self-study
Lecture: 3 hours per semester week					45 hrs	60 hrs
practical course: 1 hour per semester week					15 hrs	60 hrs
Forms of teaching						
Lecture, Practical Training						
Group size						
Lecture: Limited as per notice Practical Training: 15						
Objectives						
The students can integrate machine elements into constructions and select them according to the requirements and lay out. In addition, the static and dynamic strength of material connections can be verified.						
Contents						
Design and construction of assemblies with the following machine elements: bearings, shaft-hub connections, Clutches/brakes, gears, traction drives and seals Calculation of material connections by gluing, soldering and welding						
Use of the module						
Compulsory module of the Bachelor of Mechanical Engineering degree Compulsory module of the Bachelor of Biomimetics degree Compulsory module of the Bachelor of Mechatronics degree						
Prerequisites						
CAD, TME 1-2, GWK 1-2						
Type of Examination						
Written examination						
Requirements for award of ECTS points						
Passing the examination						
Importance of the grade of the module to the final score						
According to the examination regulations						
Lecturer						
Prof. Dr. M. Seiler						
Module coordinator						
Prof. Dr. M. Seiler						
Additional information						
Recommended reading material will be announced by the lecturer at the beginning of the course. Language: German						

1.19 Mathematics for engineering I

Mathematics for engineering I						
Code:	MAT1	Workload:	180 hrs	ECTS credits:	6	
Semester:	1	Duration:	1 semester	Frequency:	Every summer semester	
Teaching events					Attendance Time	Self-study
Lecture: 3 hours per semester week					45 hrs	90 hrs
Tutorial: 1 hour per semester week					15 hrs	30 hrs
Forms of teaching						
Lecture, Tutorial						
Group size						
Lecture: Limited as per notice Tutorial: 30						
Objectives						
The students can solve simple mathematical problems in algebra and analysis by mastering algebraic mathematical tools (real and complex numbers, vectors), one-dimensional real analysis and basic differential and integral calculus, to later apply those mathematical skills in other fields of study (e.g. Technical mechanics, Fundamentals of electrical engineering).						
Contents						
Real numbers, vectors, complex numbers Operations, sequences, series, convergence, functions Differential calculus and Riemann integration Taylor series Ordinary differential equation						
Use of the module						
Compulsory module of the Bachelor of Mechanical Engineering degree Compulsory module of the Bachelor of Biomimetics degree Compulsory module of the Bachelor of Industrial Engineering degree Compulsory module of the Bachelor of Mechatronics degree Compulsory module of the Bachelor of Robotics and Automation degree Compulsory module of the Bachelor of Sustainable Engineering and Management degree						
Prerequisites						
None						
Type of Examination						
Written examination						
Requirements for award of ECTS points						
Passing the examination						
Importance of the grade of the module to the final score						
According to the examination regulations						
Lecturer						
Prof. Dr. H. Kiel						
Module coordinator						
Prof. Dr. H. Kiel						
Additional information						
Recommended reading material will be announced by the lecturer at the beginning of the course. Language: German						

1.20 Mathematics for engineering II

Mathematics for engineering II						
Code:	MAT2	Workload:	180 hrs	ECTS credits:	6	
Semester:	2	Duration:	1 semester	Frequency:	Every summer semester	
Teaching events					Attendance Time	Self-study
Lecture: 2 hours per semester week					30 hrs	60 hrs
Tutorial: 2 hour per semester week					30 hrs	60 hrs
Forms of teaching						
Lecture, Tutorial						
Group size						
Lecture: Limited as per notice Tutorial: 30						
Objectives						
The students can solve complex mathematical problems in linear algebra and vector analysis by mastering calculations with vectors and matrices, multidimensional real analysis and advanced applications of differential and integral calculus to later apply those mathematical skills in other fields of study (e.g. Technical mechanics, Fundamentals of electrical engineering).						
Contents						
Systems of linear equations, matrices, determinants, Eigenvalues and eigenvectors, inverse matrix Riemann integration Real-valued functions, partial and total derivative, extremal values, gradient and directional derivatives, Multiple integration Line Integral of scalar field Vector-valued functions, differentiation, divergence, rotation, line integral of a vector field Basics of field theory, Potential Fourier analysis Laplace transformation Partial differential equation						
Use of the module						
Compulsory module of the Bachelor of Mechanical Engineering degree Compulsory module of the Bachelor of Biomimetics degree Compulsory module of the Bachelor of Mechatronics degree Compulsory module of the Bachelor of Sustainable Engineering and Management degree						
Prerequisites						
MAT1						
Type of Examination						
Written examination						
Requirements for award of ECTS points						
Passing the examination						
Importance of the grade of the module to the final score						
According to the examination regulations						
Lecturer						
Prof. Dr. H. Kiel						
Module coordinator						
Prof. Dr. H. Kiel						
Additional information						
Recommended reading material will be announced by the lecturer at the beginning of the course. Language: German						

1.21 Physics

Physics							
Code:	BPH	Workload:	180 hrs	ECTS credits	6		
Semester:	5	Duration:	1 semester	Frequency:	Every winter semester		
Teaching events						Attendance Time	Self-study
Lecture: 2 hours per semester week						45 hrs	90 hrs
Practical Training: 2 hour per semester week						15 hrs	30 hrs
Forms of teaching							
Lecture, Practical Training							
Group size							
Lecture: Limited as per notice Practical Training: 15							
Objectives							
Students apply physical models to mechanical problems by expressing and solving the problems mathematically. They develop an understanding of the selection of the best solution strategies and the selection of meaningful assumptions. The students acquire the competences required to analyse kinematic processes of locomotion.							
Contents							
Acoustics as technical and bionic sensors, thermodynamics, energy efficiency according to bionic phenomena, energy-optimized Systems, air conditioning based on bionic models, physics of fluid matter, density, pressure, flow resistance, Continuity Equation, Bernoulli Equation, Fluid Transport Systems, Blood Vessels, Evolution Algorithms, optimization algorithms. Physical standard experiments on mass inertia, vibration theory, conservation of momentum, conservation of energy, fluid mechanics							
Use of the module							
Compulsory module of the Bachelor of Biomimetics degree Compulsory module of the Bachelor of Sustainable Engineering and Management degree							
Prerequisites							
Contents: TME1, TME2, MAT1, Mat2							
Type of Examination							
oral examination							
Requirements for award of ECTS points							
Passing the examination and practical training							
Importance of the grade of the module to the final score							
According to the examination regulations							
Lecturer							
Prof. Dr. M. Maß							
Module coordinator							
Prof. Dr. M. Maß							
Additional information							
The current literature will be announced by the lecturer at the beginning of the module. Language: German							

1.22 Internship

Internship						
Code:	PRX	Workload:	360 hrs	ECTS credits	12	
Semester:	6	Duration:	1 semester	Frequency:	As required	
Teaching events					Attendance Time	Self-study
Internship						360 hrs
Forms of teaching						
Other						
Group size						
Individual work						
Objectives						
as per examination regulations						
Contents						
as per examination regulations						
Use of the module						
Compulsory module of the Bachelor of Mechanical Engineering degree Compulsory module of the Bachelor of Biomimetics degree Compulsory module of the Bachelor of Industrial Engineering degree Compulsory module of the Bachelor of Mechatronics degree Compulsory module of the Bachelor of Robotics and Automation degree Compulsory module of the Bachelor of Sustainable Engineering and Management degree						
Prerequisites						
110 ECTS credits						
Type of Examination						
Written composition						
Requirements for award of ECTS points						
Successfully writing the composition						
Importance of the grade of the module to the final score						
According to the examination regulations						
Lecturer						
All Professors of the department						
Module coordinator						
All Professors of the department						
Additional information						

1.23 Term Project

Term Project						
Code:	PRJ	Workload:	180 hrs	ECTS credits:	6	
Semester:	6	Duration:	1 semester	Frequency:	As required	
Teaching events					Attendance Time	Self-study
Term Project						180 hrs
Forms of teaching						
project						
Group size						
Individual work or work in small groups						
Objectives						
The students have a broad knowledge including the scientific basics in their course. They work on a theoretical or experimental topic in their discipline and thereby acquire problem-solving skills. The students are able to organize themselves and the results of their project work in a scientific way process and present.						
Contents						
To be agreed upon with the lecturer.						
Use of the module						
Compulsory module of the Bachelor of Mechanical Engineering degree Compulsory module of the Bachelor of Biomimetics degree Compulsory module of the Bachelor of Industrial Engineering degree Compulsory module of the Bachelor of Mechatronics degree Compulsory module of the Bachelor of Robotics and Automation degree Compulsory module of the Bachelor of Sustainable Engineering and Management degree						
Prerequisites						
According to the examination regulations						
Type of Examination						
Evaluation after consultation with the supervisor						
Requirements for award of ECTS points						
Passing the examination						
Importance of the grade of the module to the final score						
According to the examination regulations						
Lecturer						
All Professors of the department						
Module coordinator						
All Professors of the department						
Additional information						

1.24 Technical Mechanics I

Technical Mechanics I						
Code:	TME1	Workload:	180 hrs	ECTS credits:	6	
Semester:	1	Duration:	1 semester	Frequency:	Every winter semester	
Teaching events					Attendance Time	Self-study
Lecture: 2 hours per semester week					30 hrs	60 hrs
Tutorial: 2 hours per semester week					30 hrs	60 hrs
Forms of teaching						
Lecture, Tutorial						
Group size						
Lecture: Limited as per notice Tutorial: 30						
Objectives						
The participants can work on mechanical tasks of statics and fundamental problems of strength theory by mastering free body diagrams and equilibrium conditions, plane problems, internal forces and basics of strength theory, in order to later apply their skills to other fields of study (e.g. KTE, MTS).						
Contents						
Basics of statics: Forces, moments, force systems, solid body friction, bearing reactions, center of gravity considerations, internal forces and moments						
Use of the module						
Compulsory module of the Bachelor of Mechanical Engineering degree Compulsory module of the Bachelor of Biomimetics degree Compulsory module of the Bachelor of Industrial Engineering degree Compulsory module of the Bachelor of Mechatronics degree Compulsory module of the Bachelor of Robotics and Automation degree Compulsory module of the Bachelor of Sustainable Engineering and Management degree						
Prerequisites						
Mathematical basics						
Type of Examination						
Written examination						
Requirements for award of ECTS points						
Passing the examination						
Importance of the grade of the module to the final score						
According to the examination regulations						
Lecturer						
Prof. Dr. M. Maß						
Module coordinator						
Prof. Dr. M. Maß						
Additional information						
The current literature will be announced by the lecturer at the beginning of the module. Language: German						

1.25 Technical Mechanics II

Technical Mechanics II						
Code:	TME2	Workload:	180 hrs	ECTS credits:	6	
Semester:	2	Duration:	1 semester	Frequency:	Every winter semester	
Teaching events					Attendance Time	Self-study
Lecture: 2 hours per semester week					30 hrs	60 hrs
Tutorial: 2 hours per semester week					15 hrs	30 hrs
Practical Training: 1 hour per semeter week					15 hrs	30 hrs
Forms of teaching						
Lecture, Tutorial, Practical Training						
Group size						
Lecture: Limited as per notice Tutorial: 30 Practical Training: 15						
Objectives						
The participants can work on mechanical problems of strength of materials by using selected methods of statics and strength of material. They master models of bending, torsion and multidimensional stress states						
Contents						
Fundamentals of strength of materials, law of elasticity, state of stress, tensile and compressive loads in bars, state of deformation, Moments of area, bending and shear stress (incl. torsion for circular cross-sections) Calculate and evaluate component strength (notches, safety, equivalent stresses)						
Use of the module						
Compulsory module of the Bachelor of Mechanical Engineering degree Compulsory module of the Bachelor of Biomimetics degree Compulsory module of the Bachelor of Industrial Engineering degree Compulsory module of the Bachelor of Mechatronics degree Compulsory module of the Bachelor of Robotics and Automation degree						
Prerequisites						
TME1, mathematical basics						
Type of Examination						
Written examination						
Requirements for award of ECTS points						
Successful passing of the module examination and the internship						
Importance of the grade of the module to the final score						
According to the examination regulations						
Lecturer						
Prof. Dr. F.-J. Peitzmann						
Module coordinator						
Prof. Dr. F.-J. Peitzmann						
Additional information						
Literatur: Assmann, B. "Technische Mechanik, Bd II und III", Oldenbourg-Verlag; Hibbeler, R.C. "Technische Mechanik Bd II und III", Pearson Studium; Gross, Hauger, Schnell" Mechanik", Springer-Verlag Language: German						

1.26 Material sciences for biomimetics

Material sciences for biomimetics						
Code:	BWK	Workload:	180 hrs	ECTS credits:	6	
Semester:	2	Duration:	1 semester	Frequency:	Every summer semester	
Teaching events					Attendance Time	Self-study
Lecture: 2 hours per semester week					30 hrs	60 hrs
Practical Training: 2 hours per semester week					30 hrs	60 hrs
Forms of teaching						
Lecture, Practical Training						
Group size						
Lecture: Limited as per notice Practical Training: 15						
Objectives						
Students are able to assess the properties of a wide variety of materials. This assessment is based on the acquired knowledge of the different material tests and comparisons of the obtained characteristic values of the examined materials. They will thus be able to solve questions concerning the selection of materials.						
Contents						
Lecture: Material testing (hardness, tensile test, bending test, compression test, non-destructive tests). Comparison of the characteristics obtained for different materials. Fibre composite materials, wood as a natural material. Design of a scientific poster. Practical course: Investigation of different materials with regard to their mechanical properties. On the basis of a selected material, appropriate material tests are carried out and the results obtained are presented in the form of a poster.						
Use of the module						
Compulsory module of the Bachelor of Biomimetics degree						
Prerequisites						
Contents: GWK1						
Type of Examination						
Written examination, Presentation						
Requirements for award of ECTS points						
Passing the examination and the practical training						
Importance of the grade of the module to the final score						
According to the examination regulations						
Lecturer						
Prof. Dr. A. Springer						
Module coordinator						
Prof. Dr. A. Springer						
Additional information						
The current literature will be announced by the lecturer at the beginning of the module. Language: German						