HOCHSCHULE SCHMALKALDEN
UNIVERSITY OF APPLIED SCIENCES

Modulhandbuch (Module Handbook): Mechatronics & Robotics 210 CP BA

Nr. No.	Sem.	Ver.	Modul Module	Lehrende(r) Lecturer	Fakultät Faculty
Compulsory module 1. Semester					
1	1	0	Mathematics I BA MERO	Behn	MB
2		0	Engineering Physics BA MERO	Rödel	MB
3	1	0	Measurement BA MERO	Knechtel	ET
4	1	0	Electrical Engineering I BA MERO	Schreivogel	ET
5	1	0	Computer/Programming I BA MERO	N.N.	ET
6	1	0	German Language I BA MERO	Petschauer	ZfF
Compulsory module 2. Semester					
7	2	0	Mathematics II BA MERO	Behn	MB
8	2	0	Manufacturing Processes BA MERO	Wirtz	MB
9	2	0	Automation I BA MERO	Bachmann	ET
10	2	0	Electrical Engineering II BA MERO	Schreivogel	ET
11	2	0	Computer/Programming II BA MERO	N.N.	ET
12	2	0	German Language II BA MERO	Toronyi	ZfF
Compulsory module 3. Semester					
13	3	0	Mechanical Design I BA MERO	Dietzel	MB
14	3	0	Dynamics & Robotics BA MERO	Behn/Schrödel	MB
15	3	0	Automation II BA MERO	Bachmann	ET
16	3	0	Sensors BA MERO	Knechtel	ET
17	3	0	German Language III BA MERO	Romero Olivera	ZfF
Elective module 3. Semester: 1 to be chosen					
18	3	0	Materials Technology BA MERO	Dorner-Reisel	MB
19	3	0	Communication Networks BA MERO	Roppel	ET
Compulsory Module 4. Semester					
20	4	0	Mechanical Design II BA MERO	Dietzel	MB
21	4	0	Rapid Manufacturing Design and Technologies BA MERO	Wirtz	MB
22	4	0	Electronic Circuit Design BA MERO	N.N.	ET
23	4	0	Digital Signal Processing BA MERO	Roppel	ET
24	4	0	German Language IV BA MERO	Toronyi	ZfF
Elective module 4. Semester: 1 to be chosen					
25	4	0	Advanced Mathematics for Robotics BA MERO	Behn	MB
26	4	0	Microelectronics Technologies BA MERO	Knechtel	ET
Compulsory Module 5. Semester					
27	5	0	Simulation Driven Design BA MERO	Dietzel	MB

Nr. No.	Sem.	Ver.	Modul Module	Lehrende(r) Lecturer	Fakultät Faculty
28	5	0	Rapid Manufacturing Design	Löser	MB
29	5	0	Drives Technology BA MERO	N.N.	ET
30	5	0	Human Machine Interaction BA MERO	Schweigel	ET
31	5	0	German Language V BA MERO	Petschauer	ZfF
Elective module 5. Semester: 1 to be chosen					
32	5	1	Factory Planning & PPC BA MERO	Huxholl/Löser	MB
33	5	0	Artificial Intelligence BA MERO	Bachmann	ET
Compulsory Module 6. Semester					
34	6	0	Robotics Lab BA MERO	Schrödel	MB
35	6	0	Advanced Circuit Design BA MERO	N.N.	ET
36	6	0	Quality Management BA MERO	Huxholl/Knechtel	MB
37	6	0	Career coaching, scientific writing and presentation skills BA MERO	Hochschulbetreuer:in	MB
38	6	0	Engineering Internship part 1 BA MERO	Hochschulbetreuer:in	MB
Compulsory Module 7. Semester					
39	7	0	Engineering Internship part 2 and colloquium BA MERO	Hochschulbetreuer:in	MB
40	7	0	Bachelor Thesis BA MERO	Hochschulbetreuer:in	MB
41	7	0	Colloquium BA MERO	Hochschulbetreuer:in	MB

Scheme

Modulname Modulname	**Mathematics I BA MERO**	BM7
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Prof. Dr.-Ing. habil. Carsten Behn (Modulverantwortung)	
Qualifikationsziele Qualification goals	Mathematics is a vital tool for prospective engineers. This includes both the knowledge of analytical concepts and mathematical foundations and definitions, and the more general capability to work with abstract theories. After completion of the course students have acquired basic knowledge in one-dimensional calculus. They are able to understand mathematical concepts and apply them to concrete problems. They can analyze and formulate mathematical relations and are able to visualize them, e.g. by sketching functions in a coordinate system. Students have acquired the skills to perform abstract mathematical reasoning and to work their way into new mathematical subjects. The learning targets are: • to perform operations with logical operator and sets; • to perform calculations with complex numbers and to solve algebraic equations in the framework of complex numbers; • to handle problems from an algebraic view (using matrix-vector representations and derivations, treatment of sets on linear algebraic equations) • to apply the most important methods of the differential calculus of functions of one real variable (i.e., to determine limits of sequences, series and functions, to calculate derivatives and higher derivatives of functions, to investigate the behavior of functions (with respect to continuity, monotony, relative extrema), to apply convergence and divergence criteria for infinite series, to expand analytic functions in power series (Taylor series).	

Modulinhalte Module contents	The differential calculus of functions of one variable is treated, together with the necessary fundamentals. The main points are: 1. Fundamentals: mathematical logic and sets, number systems and (in-) equalities with a single variable 2. Complex numbers and applications 3. Vector algebra and geometrical applications 4. Systems of linear algebraic equations, 5. Matrices, determinants, eigenvectors and transformations 6. Properties of functions with a single variable 7. Continuous functions (using infinite sequences and series and limits) 8. Differential calculus of functions of one variable and applications (intro-ducing power & Taylor series of elementary functions) The teaching strategy is a mixture of lectures (using slides and the blackboard) and problem-solving tutorials (incorporating computer aided calculations using Matlab and Maple). The format of lectures is conventional, however, the atmosphere is informal, and interaction and discussion is normal. Students are encouraged to ask questions in the lectures. In the tutorials, the students work on problems to practise and apply the methods introduced in the lectures.
Lehrformen Forms of teaching	Vorlesung (2 SWS) Übung (2 SWS)
Voraussetzungen für die Teilnahme Requirements for participation	The attendance of a preliminary course „Mathematics“ before the study start is suggested.
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	• Kreyszig: Advanced Engineering Mathematics, Wiley, 9th edition, 2006 • Rattan and Klingbeil: Introductory Mathematics for Engineering Applica-tions, John Wiley & Sons, 2015. • Gilat; Matlab - An Introduction with Applications, 6th edition, John Wiley & Sons, 2017 • Fox and Bolton: Mathematics for Engineers and Technologists, Elsevier, 2002. • Batty: Essential Engineering Mathematic, BookBoon, 2011
Lehrbriefautor Textbook author	keiner

Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.	
Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 60 h + Vorbereitung 90 h = 150 Stunden = 5.0 Credit Punkte presence 60 h + preparation 90 h = 150 hours = 5.0 credit points	
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210	1
Leistungsnachweis Performance record	- written exam about 120 min. - final grade = 1/6* PE1+1/6*PE2+4/6*exam Note: In case of a third attempt, the exam can be performed as an oral exam (60 min.) in agreement with the corresponding professor to pass this course. Prüfungsvorleistung : - two preliminary examinations (PEs), each 60 min.	
Semester Semester	1	
Häufigkeit des Angebots Frequency of the offer	Anually in summer semester	
Dauer Duration	1 Semester	
Art der Lehrveranstaltung Type of course	Compulsory module 1. Semester	
Besonderes Peculiarity		

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Modulname Modulname	**Engineering Physics BA MERO**	BM2
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Prof. Dr. Christian Rödel (Modulverantwortung)	
Qualifikationsziele Qualification goals	Students are able to abstract physical facts, to form suitable models and, on the basis of these models, to put these facts into a mathematically treatable form and to solve them.	
Modulinhalte Module contents	Units of physically important parameters (such as work, energy and power), fundamentals of mechanics, fundamentals of thermodynamics, fundamentals of optics (spherical waves, coherent and incoherent scattering, Huygen's principle, reflection, refraction, total reflection, diffraction, doppler effect).	
Lehrformen Forms of teaching	Vorlesung (4 SWS) Übung (2 SWS)	
Voraussetzungen für die Teilnahme Requirements for participation		
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	Textbooks on Physics	
Lehrbriefautor Textbook author	keiner	
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.	
Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 90 h + Vorbereitung 60 h = 150 Stunden = 5.0 Credit Punkte presence 90 h + preparation 60 h = 150 hours = 5.0 credit points	
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210	1
Leistungsnachweis Performance record	Written Examination (120 min)	
Semester Semester		
Häufigkeit des Angebots Frequency of the offer	Annually in summer semester	

Dauer Duration	1 Semester
Art der Lehrveranstaltung Type of course	Compulsory module 1. Semester
Besonderes Peculiarity	--

Modulname Modulname	**Measurement BA MERO**	BM33
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Prof. Dr.-Ing. Roy Knechtel (Modulverantwortung)	
Qualifikationsziele Qualification goals	Understanding and applying the general principles of electrical and non-electrical measurement technologies such as measurement principles, the effect of the measured value acquisition on the measured object itself, as well as the resulting errors. The student will gain an insight into essential and fundamental aspects of measurement technology without gaining in-depth specialized knowledge. Based on this, the students should be able at the end of the course to independently analyze measurement problems, to recognize difficulties in the use of given measurement equipment in advance, to select suitable measurement equipment and to develop proposals for solutions. Basic practical skills in the use of measuring equipment are achieved. The course imparts predominantly technical competence 80% methodological competence 10% System competence 10% Social competence 0%	
Modulinhalte Module contents	1. subject of measurement technology 2. measurement errors: error of a measurement series, Gaussian distribution, error propagation, estimation of maximum error and probable error, compensation line, error of measuring instruments. 3. measurement of basic electrical quantities: U, I, R (DC); current and voltage measurement with indicating instruments, current and voltage range extension methods, compensation methods, Resistance measurement current and voltage correct, non-electronic multimeter and its construction and peculiarities, technical characteristics. 4. Resistor bridge: Wheatston's measuring bridge, adjustment condition, zero indicator, loop wire bridge, calculation of adjustment sensitivity, nonlinearities of bridge voltage waveforms, linear	

	approximation, loaded bridge voltage output, residual error in zero adjustment (achievable resolution, accuracy), constant current fed bridge, nonlinearity, characteristic comparison with voltage fed bridge, construction and application of various WS bridges. 5. electrical-mechanical indicating instruments: Measurement of DC and/or AC quantities and average and RMS values of target quantities (mathematics, waveform and frequency dependence). 6. analog oscilloscope: general structure, overview, operating elements, oscilloscope tube, basic electronic structure (principle circuit diagram), inputs, input voltage divider, measuring range extension, pulse characteristics, horizontal deflection, triggering, trigger aids, 2nd time base, methods of frequency and phase measurement. 7. electronic digital measurement devices: AD Converters, digital multimeters, PC supported measurement Systems and Bus-Systems 8. Applications as integrative examples: Ultrasound Sensors, Datalogger (BOSCH XDK), Length measurements, Vibration measurements --- The lectures are mainly designed to hold them with the help of the blackboard. The number of slides is limited to a minimum. Individual focal points are supported by lecture experiments. Lecture / Exercise 4 SWS all lectures
Lehrformen Forms of teaching	Vorlesung oder Übung (4 SWS)
Voraussetzungen für die Teilnahme Requirements for participation	Students must be enrolled in a degree program in the Electrical Engineering Department.
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	Sławomir Tumański: Principles of Electrical Measurement Alan S. Morris, Reza Langari: Measurement and Instrumentation: Theory and Application All copies of slides as well as special literature and learning programs will be provided via StudIP.

Lehrbriefautor Textbook author	keiner	
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.	
Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 60 h + Vorbereitung 90 h = 150 Stunden = 5.0 Credit Punkte presence 60 h + preparation 90 h = 150 hours = 5.0 credit points	
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210	1
Leistungsnachweis Performance record	Designation of the subject examination: Measurement written examination (PS), 120 minutes. For the participation in the written exam a registration according to the study and examination regulations of the faculty is required.	
Semester Semester	1	
Häufigkeit des Angebots Frequency of the offer	Annually in summer semester	
Dauer Duration	1 Semester	
Art der Lehrveranstaltung Type of course	Compulsory module 1. Semester	
Besonderes Peculiarity		

Modulname Modulname	**Electrical Engineering I BA MERO**	BM36
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Prof. Dr.-Ing. Martin Schreivogel (Modulverantwortung)	
Qualifikationsziele Qualification goals	The lecture starts from fundamental aspects of electric phenomena and explains their technical utilization in different kinds of application areas. Target is to be able to understand and explain basic working principles of e.g. sensors and electrical machines like electric engines and transformators. The gained knowledge enables the students to perform electrotechnical considerations qualitatively and quantitatively as basis for different subsequent courses. Besides the lecture itself there is a strong focus on practicing and internalization of the principles during the seminar. The first part of the two courses starts from electrical and current density fields and leads to the calculation of DC networks.	
Modulinhalte Module contents	• Electric charge and electric fields • Charge transport and current density • Basic electric components and their characteristics • Active and passive two terminal networks • DC networks • Current, voltage and power measurement • Different calculations methods, e.g. Kirchhoff's laws	
Lehrformen Forms of teaching	Vorlesung (2 SWS) Übung (2 SWS)	
Voraussetzungen für die Teilnahme Requirements for participation	Basic knowledge in Mathematics and Physics	
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	Script + various Fundamentals of Electrical Engineering standard books	
Lehrbriefautor Textbook author	keiner	
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.	

Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 60 h + Vorbereitung 90 h = 150 Stunden = 5.0 Credit Punkte presence 60 h + preparation 90 h = 150 hours = 5.0 credit points	
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210	1
Leistungsnachweis Performance record	written Exam (120 min)	
Semester Semester	1	
Häufigkeit des Angebots Frequency of the offer	Annualy in Summer Semester	
Dauer Duration	1 Semester	
Art der Lehrveranstaltung Type of course	Compulsory module 1. Semester	
Besonderes Peculiarity		

Modulname Modulname	**Computer/Programming I BA MERO**	BM37
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Nomen Nominandum (Modulverantwortung)	
Qualifikationsziele Qualification goals	The students know the concept of information and understand methods for measuring the amount of information. They understand important concepts of theoretical computer science, such as logic, automata and formal languages, as well as complexity. You can use methods to notation algorithms. You know the basic structure of a computer. The event mainly mediates Professional competence 80 % Methodological competence 20 % System competence 0 % Social competence 0 %	
Modulinhalte Module contents	1. Overview of the content and application of theoretical computer science, technical computer science and practical computer science 2. Definition and measurement concepts of information 3. Number systems 4. Propositional logic, Boolean algebra 5. Formal and intuitive algorithm terms, computability 6. Automata and formal languages, generative grammars 7. Notation forms and design of algorithms 8. Properties of algorithms and their proof 9. Computer architectures, computer arithmetic	
Lehrformen Forms of teaching	Vorlesung (3 SWS) Übung (1 SWS)	
Voraussetzungen für die Teilnahme Requirements for participation	Students must be enrolled in a degree program of the Faculty of Electrical Engineering.	
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	Ch. Horn, I. O. Kerner: Lehr- und Übungsbuch Informatik. Fachbuchverlag Leipzig, 1995	
Lehrbriefautor Textbook author	keiner	
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.	

Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 60 h + Vorbereitung 90 h = 150 Stunden = 5.0 Credit Punkte presence 60 h + preparation 90 h = 150 hours = 5.0 credit points	
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210	1
Leistungsnachweis Performance record	Written Exam (120 min) Aids: Lecture notes, exercise materials, books, calculators without conversions of numbers into other number systems, no programmable calculators	
Semester Semester	1	
Häufigkeit des Angebots Frequency of the offer	Annualy in Summer Semester	
Dauer Duration	1 Semester	
Art der Lehrveranstaltung Type of course	Compulsory module 1. Semester	
Besonderes Peculiarity		

Modulname Modulname	**German Language I BA MERO**	BM50
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Ramona Alina Petschauer (Modulverantwortung)	
Qualifikationsziele Qualification goals	The course aims to build up the students' ability to communicate in everyday situations. Upon completion of this course the students will be able: • to understand and use simple words, everyday expressions and very simple structures in very familiar situations. • to ask and answer simple questions, initiate and respond to simple statements aimed at the satisfaction of immediate needs or on very familiar topics. • to interact in a simple way but communication is totally dependent on repetition at a slower rate of speech, rephrasing and repair. • to use a few simple grammatical structures and sentence patterns in their utterances and to link words, groups of words or short sentences with linear connectors like "and", "but", or "then". • to identify the topic and understand individual pieces of information in informative texts which contain a wide range of shared international vocabulary items and/or are supported visually. • to understand names, numbers, quantities, cost and time, when spoken clearly or when the texts are written in a plain, easy language and deal with everyday needs. • to write short, simple texts that help maintain social contacts, e.g., emails, postcards, (WhatsApp) messages, and to make simple, mostly bullet point-like written messages on familiar topics using the dictionary.	

Modulinhalte Module contents	The course provides basic knowledge of German and is oriented towards the language competence level A1.1 of the Common European Framework of Reference for Languages (CEFR). The course trains all four language skills (speaking, listening, reading and writing) and covers: • lexis on simple topics such as: introducing oneself and others, family and friends, food and drink, leisure time, living conditions, daily routine, means of transport; • grammar structures such as article and noun declension in the nominative and accusative case, verb forms in the present tense, word order in statements and in interrogative clauses, comparison of the adjectives, imperative, negation, verbs with separable particles; • phonetics and listening comprehension exercises.
Lehrformen Forms of teaching	Seminar oder Übung (4 SWS)
Voraussetzungen für die Teilnahme Requirements for participation	No prior knowledge of German
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	Lecture script
Lehrbriefautor Textbook author	keiner
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.
Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 60 h + Vorbereitung 90 h = 150 Stunden = 5.0 Credit Punkte presence 60 h + preparation 90 h = 150 hours = 5.0 credit points
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210 | 1
Leistungsnachweis Performance record	written Exam (120 min)
Semester Semester	1
Häufigkeit des Angebots Frequency of the offer	Annualy in Summer Semester
Dauer Duration	1 Semester
Art der Lehrveranstaltung Type of course	Compulsory module 1. Semester

Besonderes Peculiarity	

Modulname Modulname	**Mathematics II BA MERO**	BM6
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Prof. Dr.-Ing. habil. Carsten Behn (Modulverantwortung)	
Qualifikationsziele Qualification goals	The students are able to apply the most important methods of the integral calculus of functions of one real variable: Especially, they can • determine primitive functions, • calculate the definite integrals of some elementary functions, • integrate rational functions, • determine the convergence behavior (respectively, divergence behavior) of improper integrals. Moreover, the students get acquainted with the differential and integral theory of functions with more than one variable. They will be able to charactarize, classify, model and solve problems with more than one variable, especially in context of real problems from the engineering world. Finally, to solve problems from, e.g., Elastostatics and Dynamics, the student will be familiar with the theory of ordinary differential equations of first and second order.	

Modulinhalte Module contents	The integral calculus of functions of one variable and the differential and integral calculus of functions with more than one varible are treated, together with the necessary fundamentals. The main points are: 1. Integral calculus: methods for primitive functions and (in-) definite integrals, handling of improper integrals, 2. Application of integral calculus: geometrical problems, Fourier series 3. Differential and integral calculus of functions of more than one variable 4. Introduction to the theory of ordinary differential equations (1st and 2nd order, linear vs. nonlinear, existence of solutions) The teaching strategy is a mixture of lectures (using slides and the blackboard) and problem-solving tutorials (incorporating computer aided calculations using Matlab and Maple). The format of lectures is conventional, however, the atmosphere is informal, and interaction and discussion is normal. Students are encouraged to ask questions in the lectures. In the tutorials, the students work on problems to practise and apply the methods introduced in the lectures.
Lehrformen Forms of teaching	Vorlesung (2 SWS) Übung (2 SWS)
Voraussetzungen für die Teilnahme Requirements for participation	The successful completion of the course „Mathematics for Engineers 1“ would be beneficial.
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	• Kreyszig: Advanced Engineering Mathematics, Wiley, 9th edition, 2006 • Rattan and Klingbeil: Introductory Mathematics for Engineering Applica-tions, John Wiley & Sons, 2015. • Gilat; Matlab - An Introduction with Applications, 6th edition, John Wiley & Sons, 2017 • Fox and Bolton: Mathematics for Engineers and Technologists, Elsevier, 2002. • Batty: Essential Engineering Mathematic, BookBoon, 2011
Lehrbriefautor Textbook author	keiner
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.

Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 60 h + Vorbereitung 90 h = 150 Stunden = 5.0 Credit Punkte presence 60 h + preparation 90 h = 150 hours = 5.0 credit points	
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210	1
Leistungsnachweis Performance record	• written exam about 120 min. • final grade = 1/3* PE+2/3*exam Note: In case of a third attempt, the exam can be performed as an oral exam (60 min.) in agreement with the corresponding professor to pass this course. Prüfungsvorleistung : • one preliminary examination (PE), 60 min.	
Semester Semester	2	
Häufigkeit des Angebots Frequency of the offer	Annually in winter semester every academic year	
Dauer Duration	1 Semester	
Art der Lehrveranstaltung Type of course	Compulsory module 2. Semester	
Besonderes Peculiarity		

Modulname Modulname	**Manufacturing Processes BA MERO**	BM10
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Jun.-Prof. Dr.-Ing. Andreas Wirtz (Modulverantwortung)	
Qualifikationsziele Qualification goals	The students learn the basics of machining processes with geometrically determined and undetermined cutting edges as well as ablation processes. They understand the functional principles of the individual processes which allows them to compare different cutting processes with regard to the technical and economic effort and essential work results to be achieved. By this, the suitability of specific processes for a particular task can be evaluated on the basis of the relationship between the functional principle, the work result and the effort required. By this, the understanding of manufacturing-compatible design is shaped. In the accompanying practical course, students work in groups to learn the procedure for planning and designing machining processes for the production of individual form and functional elements of a specific workpiece. A joint presentation and discussion of the results trains the participants' communication and teamwork skills as well as their ability to express themselves.	
Modulinhalte Module contents	• Definitions, classification and categorization of cutting and ablation processes. • Fundamentals of cutting with geometrically defined and geometrically undefined cutting edges: essential process variants, characteristics, design and machining results of the various manufacturing processes • Functional principles of the manufacturing processes turning, milling, drilling, grinding, honing and spark-erosive machining • Working in groups, students learn how to select, plan, and design appropriate machining processes and calculate manufacturing time and costs.	
Lehrformen Forms of teaching	Vorlesung (3 SWS) Laborpraktikum (1 SWS)	
Voraussetzungen für die Teilnahme Requirements for participation	Basic knowledge of reading of technical drawings; basic knowledge of 3D CAD software is helpful, but not required; fundamentals of Engineering Mechanics	

Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	*Supporting documents: Set of slides with solved and explained examples* *Recommended publications:* • Klocke, F.: Manufacturing Processes 1: Cutting. Springer Verlag, 2011, doi: 10.1007/978-3-642-11979-8. • Klocke, F.: Manufacturing Processes 2: Grinding, Honing, Lapping. Springer Verlag, 2009, doi: 10.1007/978-3-540-92259-9. • Tschätsch, H.: Applied Machining Technology, Springer Verlag, doi: 10.1007/978-3-642-01007-1. • Mechanical and Metal Trades Handbook, 4. Edition, Europa Verlag, 2018, ISBN 978-3-8085-1915-8.
Lehrbriefautor Textbook author	keiner
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.
Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 60 h + Vorbereitung 90 h = 150 Stunden = 5.0 Credit Punkte presence 60 h + preparation 90 h = 150 hours = 5.0 credit points
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210 | 1
Leistungsnachweis Performance record	Written Exam, 120 Min Prüfungsvorleistung : Graded presentation in groups as a part of the practical laboratory course
Semester Semester	2
Häufigkeit des Angebots Frequency of the offer	Annually in winter semester
Dauer Duration	1 Semester
Art der Lehrveranstaltung Type of course	Compulsory module 2. Semester
Besonderes Peculiarity	

Modulname Modulname	**Automation I BA MERO**	BM30
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Prof. Dr.-Ing. Silvio Bachmann (Modulverantwortung)	
Qualifikationsziele Qualification goals	Students understand structure and functionality of flexible automation systems. You learn design methods for such technical systems and solutions and could practice it in development process. Lesson is divided in Technical information 40 % Method knowledge 50 % System competence 10 %	
Modulinhalte Module contents	Parts - Introduction - Project management - Methods in development processes - Process analyzing - Sensors and actors - Automation devices - Software Development - Communication in Automation - SCADA	
Lehrformen Forms of teaching	Vorlesung (4 SWS)	
Voraussetzungen für die Teilnahme Requirements for participation	Basic knowledge in system control	
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	Script	
Lehrbriefautor Textbook author	keiner	
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.	
Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 60 h + Vorbereitung 90 h = 150 Stunden = 5.0 Credit Punkte presence 60 h + preparation 90 h = 150 hours = 5.0 credit points	

ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210	1
Leistungsnachweis Performance record	Written examination 120 min.	
Semester Semester	2	
Häufigkeit des Angebots Frequency of the offer	Annually in summer semester	
Dauer Duration	1 Semester	
Art der Lehrveranstaltung Type of course	Compulsory module 2. Semester	
Besonderes Peculiarity		

Modulname Modulname	**Electrical Engineering II BA MERO**	BM38
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Prof. Dr.-Ing. Martin Schreivogel (Modulverantwortung)	
Qualifikationsziele Qualification goals	The lecture starts from fundamental aspects of electric phenomena and explains their technical utilization in different kinds of application areas. Target is to be able to understand and explain basic working principles of e.g. sensors and electrical machines like electric engines and transformators. The gained knowledge enables the students to perform electrotechnical considerations qualitatively and quantitatively as basis for different subsequent courses. Besides the lecture itself there is a strong focus on practicing and internalization of the principles during the seminar. The second part of the two courses starts from magnetic fields and leads to the calculation of AC networks.	
Modulinhalte Module contents	• Magnetic field fundamentals • Magnetic circuits • Magnetic induction • Basic aspects of AC currents • Calculation of AC networks • AC electrical motors • Frequency dependent phenomena • Alternative power sources	
Lehrformen Forms of teaching	Vorlesung (2 SWS) Übung (2 SWS)	
Voraussetzungen für die Teilnahme Requirements for participation	Basic knowledge in Mathematics and Physics, Electrical Engineering I	
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	Script + various Fundamentals of Electrical Engineering standard books	
Lehrbriefautor Textbook author	keiner	
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.	

Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 60 h + Vorbereitung 90 h = 150 Stunden = 5.0 Credit Punkte presence 60 h + preparation 90 h = 150 hours = 5.0 credit points	
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210	1
Leistungsnachweis Performance record	Written exam (120 min)	
Semester Semester	2	
Häufigkeit des Angebots Frequency of the offer	Annually in winter semester	
Dauer Duration	1 Semester	
Art der Lehrveranstaltung Type of course	Compulsory module 2. Semester	
Besonderes Peculiarity		

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Modulname Modulname	**Computer/Programming II BA MERO**	BM39
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Nomen Nominandum (Modulverantwortung)	
Qualifikationsziele Qualification goals	The students know the syntax of the programming language C / C++ and can apply them to algorithms and implement them programmatically. You are able to create software projects with development tools, e.g. MS Visual Studio, put it into operation and test it. Professional competence 70 % Methodological competence 30 % System competence 0 % Social competence 0 %	
Modulinhalte Module contents	1. Programming language C/C++, functions, constants, expressions, operators, control flow, loops, data types, storage classes, pointers, dynamic memory management 2. Creating data structures and access mechanisms to them 3. Application of pointers 4. Standard library, string functions, access to files 5. evelopment of software projects 6. Conversion of algorithms into executable programs and test strategies 7. Introduction to Object-Oriented Programming	
Lehrformen Forms of teaching	Vorlesung (2 SWS) Übung (2 SWS)	
Voraussetzungen für die Teilnahme Requirements for participation	Computer/Programming I Students must be enrolled in a degree program of the Faculty of Electrical Engineering.	
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	various standard books on the basics of Computer/Programming	
Lehrbriefautor Textbook author	keiner	
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.	

Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 60 h + Vorbereitung 90 h = 150 Stunden = 5.0 Credit Punkte presence 60 h + preparation 90 h = 150 hours = 5.0 credit points	
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210	1
Leistungsnachweis Performance record	written exam (120 min)	
Semester Semester	2	
Häufigkeit des Angebots Frequency of the offer	Annually in winter semester	
Dauer Duration	1 Semester	
Art der Lehrveranstaltung Type of course	Compulsory module 2. Semester	
Besonderes Peculiarity		

Modulname Modulname	**German Language II BA MERO**	BM51
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Dr. Anita Toronyi (Modulverantwortung)	
Qualifikationsziele Qualification goals	The course aims to build up and improve the students' ability to communicate in everyday situations. Upon completion of this course the students will be able: • to understand familiar everyday expressions and simple sentences aimed at the satisfaction of simple needs, if spoken clearly and slowly in standard language and if important facts are repeated. • to understand questions and instructions addressed carefully and slowly to them and follow short, simple directions. • to hold simple conversations about everyday life and personal interests or events in a slow and clear way. • to understand short, simple texts on familiar concrete topics using common everyday language, given the opportunity for repeated reading. • to use a few simple grammatical structures and sentence patterns in their utterances and link short sentences with the connectors like "and", "but", "or", "because", "first", "then" or "after". • to write simple messages and short texts, such as letters, invitations or short replies, which refer to themselves or in which they ask for and pass on information from everyday life. • to pass on a few familiar expressions from frequently used, simple German-language utterances on familiar topics, spoken slowly and clearly in standard language, to other people in the common language.	

Modulinhalte Module contents	The course provides basic knowledge of German and is oriented towards the language competence level A1.2 of the Common European Framework of Reference for Languages (CEFR). The course trains all four language skills (speaking, listening, reading and writing) and covers: • lexis on simple topics such as: profession and activities, making appointments, destinations and travel preparations, weather, the seasons and the weather, health; • grammar structures such as article and noun declension in the nominative, accusative and dative case, modal verbs, past tense, future tense, adjective declension, personal pronouns in the nominative, accusative and dative case; • phonetics and listening comprehension exercises.
Lehrformen Forms of teaching	Seminar oder Übung (4 SWS)
Voraussetzungen für die Teilnahme Requirements for participation	German Language skills at A1.1 level
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	Lecture script
Lehrbriefautor Textbook author	keiner
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.
Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 60 h + Vorbereitung 90 h = 150 Stunden = 5.0 Credit Punkte presence 60 h + preparation 90 h = 150 hours = 5.0 credit points
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210 | 1
Leistungsnachweis Performance record	Written exam (120 min
Semester Semester	2
Häufigkeit des Angebots Frequency of the offer	Annually in winter semester
Dauer Duration	1 Semester
Art der Lehrveranstaltung Type of course	Compulsory module 2. Semester

Besonderes Peculiarity	

Modulname Modulname	**Mechanical Design I BA MERO**	BM3
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Prof. Dr.-Ing. Andreas Dietzel (Modulverantwortung)	
Qualifikationsziele Qualification goals	The students are enabled to read and prepare technical drawings. They are able to combine construction elements into simple structures and represent them in drawings including parts lists (freehand drawings). In particular, the students also know the necessity and basics of a complete geometrical product specification (dimensional, geometrical and positional tolerances / surface roughness / etc.). In addition, the participants acquire the ability to design technical components within a 3D CAD software and to derive production drawings.	
Modulinhalte Module contents	**Lecture:** Basics of technical product documentation with a focus on technical drawing **Exercise:** Application of all basics covered in the lecture by means of design exercises incl. preparing various technical drawings **Lab:** • introduction to a commercially available 3D CAD software • creating simple CAD models and drawings with industry-standard, computer-aided tools	
Lehrformen Forms of teaching	Vorlesung (2 SWS) Übung (1 SWS) Laborpraktikum (1 SWS)	
Voraussetzungen für die Teilnahme Requirements for participation	none	
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	Lecture notes and standard literature of design engineering are made available via studIP.	
Lehrbriefautor Textbook author	keiner	

Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.	
Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 60 h + Vorbereitung 90 h = 150 Stunden = 5.0 Credit Punkte presence 60 h + preparation 90 h = 150 hours = 5.0 credit points	
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210	1
Leistungsnachweis Performance record	Written exam : 120 min	
Semester Semester	3	
Häufigkeit des Angebots Frequency of the offer	Annually in summer semester	
Dauer Duration	1 Semester	
Art der Lehrveranstaltung Type of course	Compulsory module 3. Semester	
Besonderes Peculiarity		

Modulname Modulname	**Dynamics & Robotics BA MERO**	BM8
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Prof. Dr.-Ing. habil. Carsten Behn (Modulverantwortung) Prof. Dr.-Ing. Frank Schrödel (Modulverantwortung)	
Qualifikationsziele Qualification goals	With focus on real problems from the engineering world, e.g., from Physics or Mechanics or Robotics, the student shall be familiar with the kinematic and dynamic description of robotic systems. For this, this course gives a quick introduction to some modeling aspects and starts up with facts from the kinematic theory: the geometrical description of the movement of systems. This is trained in application to inverse kinematic problems in robotics. To govern the necessary driving forces a dynamical treatment of the given system is necessary. Hence, the ongoing course provides basic dynamical principles from several dynamic theories: principles of linear and angular momentum in contrast to the Lagrangian equations of the 2nd kind. Having this at hand, the students are able to solve the inverse dynamic tasks.	

Modulinhalte Module contents	• Aspects from Modeling: bodies (mass point, rigid and elastic bodies), couplings (geometrical and impressed ones), forces (geometrical, conservative and non-conservative ones) • Kinematics: description of the movement of particles and rigid bodies from the geometrical point of view, determination of position, velocity and acceleration vectors • Application 1: determination of the reachability set of robot manipulators and inverse kinematics in application to robotic systems • Dynamics: Introduction to Newton-Euler mechanics (Principles of Linear and Angular Momentum), Lagrange formalism to dynamical systems • Application 2: Inverse Dynamics to govern the necessary driving forces The teaching strategy is a mixture of lectures (using slides and the blackboard) and problem-solving tutorials (incorporating computer aided calculations using Matlab and Maple). The format of lectures is conventional, however, the atmosphere is informal, and interaction and discussion is normal. Students are encouraged to ask questions in the lectures. In the tutorials, the students work on problems to practise and apply the methods introduced in the lectures.
Lehrformen Forms of teaching	Vorlesung (2 SWS) Übung (2 SWS)
Voraussetzungen für die Teilnahme Requirements for participation	The successful completion of the courses „Mathematics for Engineers 1“ and „Engineering Physics“ would be beneficial.
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	• Bird: Higher Engineering Mathematics, Routledge, Taylor & Francis Group, 8th edition, 2017 • McCloy and Harris: Robotics, Springer, 2014 • Zimmermann, Zeidis and Behn: Mechanics of Terrestrial Locomotion, Springer, 2009 • Hibbeler: Engineering Mechanics - Dynamics, 14th edition, Wiley, 2015 • Gross et al.: Engineering Mechanics 3 - Dynamics, Springer, 2nd edition, 2015
Lehrbriefautor Textbook author	keiner
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.

Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 60 h + Vorbereitung 90 h = 150 Stunden = 5.0 Credit Punkte presence 60 h + preparation 90 h = 150 hours = 5.0 credit points	
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210	1
Leistungsnachweis Performance record	Written exam about 120 min. Note: In case of a third attempt, the exam can be performed as an oral exam (60 min.) in agreement with the corresponding professor to pass this course.	
Semester Semester	3	
Häufigkeit des Angebots Frequency of the offer	Annually in winter semester	
Dauer Duration	1 Semester	
Art der Lehrveranstaltung Type of course	Compulsory module 3. Semester	
Besonderes Peculiarity		

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Modulname Modulname	**Automation II BA MERO**	BM31
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Prof. Dr.-Ing. Silvio Bachmann (Modulverantwortung)	
Qualifikationsziele Qualification goals	Students extend their knowledge in design of flexible automation systems. You learn design methods of that kind technical systems and solutions and could practice it in development process. Lesson is divided in Technical information 60 % Method knowledge 30 % System competence 10 %	
Modulinhalte Module contents	Parts - Automation and control - Basic of control theory - Automation systems as information systems - Decentral design of automation systems - Communication in automation - Decentral structures - Human interaction - Integration of robots - Practice with Siemens TIA Portal	
Lehrformen Forms of teaching	Vorlesung (4 SWS)	
Voraussetzungen für die Teilnahme Requirements for participation	Basic knowledge in automation (automation I)	
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes		
Lehrbriefautor Textbook author	keiner	
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.	
Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 60 h + Vorbereitung 90 h = 150 Stunden = 5.0 Credit Punkte presence 60 h + preparation 90 h = 150 hours = 5.0 credit points	

ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210	1
Leistungsnachweis Performance record	Written examination 120 min.	
Semester Semester	3	
Häufigkeit des Angebots Frequency of the offer	Annually in winter semester	
Dauer Duration	1 Semester	
Art der Lehrveranstaltung Type of course	Compulsory module 3. Semester	
Besonderes Peculiarity		

Modulname Modulname	**Sensors BA MERO**	BM35
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Prof. Dr.-Ing. Roy Knechtel (Modulverantwortung)	
Qualifikationsziele Qualification goals	Getting to know essential selected sensor principles, according to which sensors for different applications work and acquire information for control or analysis. Knowledge of important physical principles for the detection of specific measurands will be covered and deepened. Based on this, students should be able to compare, analyze and evaluate different operating principles for the same measurands and assess their advantages and disadvantages together with the required technical and electronic effort for possible planned applications. Introducing real applicable sensors for selected measurement and sensing principles should help to further deepen and consolidate the subject matter. Practical knowledge about application characteristics of e.g. vehicle sensors and industrial sensors should be acquired and knowledge about measurement signal acquisition and a required measurement signal analysis should be imparted. Ultimately, the students should be able to use the acquired specialist knowledge to correctly classify emerging sensor principles in their specialist environment. In addition, students should be able to quickly familiarize themselves with the specifics of a wide variety of sensors to be able to recognize potential fields of application or to develop them themselves. The course imparts mainly Technical competence 60% Methodological competence 20% System competence 20 % Social competence 0 %	

Modulinhalte Module contents	Electrical measurement of mechanical and other quantities: • Strain, force, and torque measurement (strain gauges). • Measurement of pressures (overview of different pressure sensors, flow and level measurement), • Magnetic field sensors (operating principles and realization, application for speed, displacement, angle, and distance measurement) • Temperature measurement (resistance thermometers, thermocouples, error effects) • Inertial sensors basic operating principles and applications as well as Manufacturing processes for MEMS sensors (especially acceleration sensors) • Ultrasonic sensors (displacement measurement, material analysis and medical technology) • Gas sensors (resistive MOX sensors, optical NDIR sensors - operating principles, differences and applications) • Displacement and angle sensors (Abbe principle, incremental and coded sensors, laser measurement technology) • Measurement and signal transmission (electrical principles, current and voltage transmission, bus systems) • Calibration technology (calibration and adjustment, traceability, process calibrator, calibration protocols)
Lehrformen Forms of teaching	Vorlesung (4 SWS)
Voraussetzungen für die Teilnahme Requirements for participation	Students must be enrolled in a degree program in the Electrical Engineering Department.
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	Lang, Walter: Sensors and Measurement Systems, Second Edition All copies of slides as well as special literature and learning programs will be provided via StudIP
Lehrbriefautor Textbook author	keiner
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.
Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 60 h + Vorbereitung 90 h = 150 Stunden = 5.0 Credit Punkte presence 60 h + preparation 90 h = 150 hours = 5.0 credit points

ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210	1
Leistungsnachweis Performance record	• Designation of the subject examination: Measurement written examination (PS), 120 minutes. • For the participation in the written exam a registration according to the study and examination regulations of the faculty is required..	
Semester Semester	3	
Häufigkeit des Angebots Frequency of the offer	Annually in summer semester	
Dauer Duration	1 Semester	
Art der Lehrveranstaltung Type of course	Compulsory module 3. Semester	
Besonderes Peculiarity		

Modulname Modulname	**German Language III BA MERO**	BM52
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Jesus Eduardo Romero Olivera (Modulverantwortung)	
Qualifikationsziele Qualification goals	The course aims to improve the students' ability to express themselves in everyday situations as well as to build up their ability to communicate in academic and professional contexts. Upon completion of this course the students will be able: • to communicate in simple and routine tasks requiring a simple and direct exchange of information on familiar and routine matters. • to handle very short social exchanges, to use simple everyday polite forms of greeting and address, to make and respond to invitations and apologies. • to understand simple facts, figures or instructions in familiar academic or job-related situations. • to understand short, simple texts containing the highest frequency vocabulary including a proportion of shared international vocabulary items. • to understand simple written instructions if they are structured step by step and visually supported. • to report on personal experiences, events, own activities, to talk about plans or agreements with others in simple terms. • to fill in simple and very common forms requiring personal or professional information. • to write reasonably correctly using simple expressions and short sentences about everyday aspects of their own environment.	

Modulinhalte Module contents	The course provides basic knowledge of German and is oriented towards the language competence level A2.1 of the Common European Framework of Reference for Languages (CEFR). The course trains all four language skills (speaking, listening, reading and writing) and covers: • lexis on topics such as: school and training, studying in Germany, talking about the past, social background, purchasing and spending money, media, holidays and celebrations; • grammar structures such as article and noun declension in the genitive, the simple past of modal verbs and auxiliary verbs, main clauses and subordinate clauses, adjective declension, future tense, article and noun declension in the dative case, personal pronouns in the nominative, accusative and dative case; • phonetics and listening comprehension exercises.
Lehrformen Forms of teaching	Seminar oder Übung (4 SWS)
Voraussetzungen für die Teilnahme Requirements for participation	German language skills at A1.2 level
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	Lecture script
Lehrbriefautor Textbook author	keiner
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.
Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 60 h + Vorbereitung 90 h = 150 Stunden = 5.0 Credit Punkte presence 60 h + preparation 90 h = 150 hours = 5.0 credit points
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210 | 1
Leistungsnachweis Performance record	Written exam (120 min)
Semester Semester	3
Häufigkeit des Angebots Frequency of the offer	Annually in Summer Semester

Dauer Duration	1 Semester
Art der Lehrveranstaltung Type of course	Compulsory module 3. Semester
Besonderes Peculiarity	

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Modulname Modulname	**Materials Technology BA MERO**	BM11
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Prof. Dr.-Ing. habil Annett Dorner-Reisel (Modulverantwortung)	
Qualifikationsziele Qualification goals	The student should understand basics and technological aspects of materials. Hereby, the ability is acquired to improve selection, application and durability as well as sustainability of materials of the groups metals, ceramics, composites, coatings and other compounds to their structure and composition. Simulations programs should be better understood.	
Modulinhalte Module contents	Basic principles of materials and technology, properties of metals, ceramics, polymers, composites, special coatings, nanomaterials as well as smart effects, explanation of simulation programs	
Lehrformen Forms of teaching	Vorlesung (2 SWS) Laborpraktikum (2 SWS)	
Voraussetzungen für die Teilnahme Requirements for participation	Knowledge in chemistry and physics	
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	Textbooks on materials technology and nano- and smart materials CES Edupack GRANTA Design Software*	
Lehrbriefautor Textbook author	keiner	
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.	
Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 60 h + Vorbereitung 90 h = 150 Stunden = 5.0 Credit Punkte presence 60 h + preparation 90 h = 150 hours = 5.0 credit points	
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210	1
Leistungsnachweis Performance record	Written examination (120 min)	
Semester Semester	3	
Häufigkeit des Angebots Frequency of the offer	Annually in summer semester	
Dauer Duration	1 Semester	

Art der Lehrveranstaltung Type of course	Elective module 3. Semester: 1 to be chosen
Besonderes Peculiarity	

Modulname Modulname	**Communication Networks BA MERO**	BM40
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Prof. Dr.-Ing. Carsten Roppel (Modulverantwortung)	
Qualifikationsziele Qualification goals	You can understand and analyse basic principles of communication networks, like circuit and packet switching, error handling and traffic management. You are familiar with Internet Protocols and real-time services. You know other classical networking technolgies. You know how to work with a protocol analyser software. The event mainly mediates Professional competence 60 % Methodological competence 20 % System competence 20 % Social competence 0 %	
Modulinhalte Module contents	1. Introduction and Overview 2. Design Principles 3. Transport, Access and Local Area Networks 4. Quality of Service and Traffic Management 5. Internet Protocols 6. Real-Time Services over Packet-Switched Networks 7. Asynchronous Transfer Mode (ATM) 8. Integrated Services Digital Network (ISDN)	
Lehrformen Forms of teaching	Vorlesung (3 SWS) Übung (1 SWS)	
Voraussetzungen für die Teilnahme Requirements for participation	Not specified	

Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	A lecture script will be provided. Literature: 1. Bertsekas, D., Gallager, R.: Data Networks. Prentice-Hall, 1992. 2. Keshav, S.: An Engineering Approach to Computer Networking: ATM Networks, the Internet, and the Telephone Network. Addison-Wesley, 1997. 3. Roppel, C.: Grundlagen der Nachrichtentechnik. Hanser-Verlag, 2018. 4. Stallings, W.: Data & Computer Communications. Prentice-Hall, 6th. Ed., 2006. 5. Tanenbaum, A. S., Wetherall, D. J.: Computer Networks. Pearson, 5th. Ed., 2011.
Lehrbriefautor Textbook author	keiner
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.
Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 60 h + Vorbereitung 90 h = 150 Stunden = 5.0 Credit Punkte presence 60 h + preparation 90 h = 150 hours = 5.0 credit points
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210 | 1
Leistungsnachweis Performance record	written exam (120 min)
Semester Semester	3
Häufigkeit des Angebots Frequency of the offer	Annually in Summer Semester
Dauer Duration	1 Semester
Art der Lehrveranstaltung Type of course	Elective module 3. Semester: 1 to be chosen
Besonderes Peculiarity	

Modulname Modulname	**Mechanical Design II BA MERO**	BM4
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Prof. Dr.-Ing. Andreas Dietzel (Modulverantwortung)	
Qualifikationsziele Qualification goals	On competition of this course, the students should have some background knowledge to the design of jigs and fixtures and their economic use in automated production systems. With regards to selected machine elements, which are typical for jigs and fixtures, the students are able to analyse and calculate them with regard to their function and application and select them from corresponding standards and tables. The participants can also create assembly models using a 3D CAD system and derive drawings and parts lists from them that meet requirements.	

Modulinhalte Module contents	**Lecture:** • structure of jigs and fixtures • function and application of fixture elements ◦ determining/determining elements, tolerance analysis ◦ clamping/clamping elements, clamping force calculations ◦ tool guidance o grippers, vacuum grippers and sensors • function, application and calculation principles of selected machine elements ◦ screw connections ◦ bolt and pin connections ◦ springs ◦ sliding and rolling bearings **Exercise:** Application of all basics covered in the lecture by means of design exercises incl. various calculation examples **Lab:** • introduction to assembly modelling using a commercially available 3D CAD system, based on the design of a jig • create simple CAD models of assemblies as well as derive drawings and parts lists with industry-standard, computer-aided tools.
Lehrformen Forms of teaching	Vorlesung (2 SWS) Übung (1 SWS) Laborpraktikum (1 SWS)
Voraussetzungen für die Teilnahme Requirements for participation	Mechanical Design I MERO
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	Lecture notes and standard literature of design engineering are made available via studIP.
Lehrbriefautor Textbook author	keiner

Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.	
Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 60 h + Vorbereitung 90 h = 150 Stunden = 5.0 Credit Punkte presence 60 h + preparation 90 h = 150 hours = 5.0 credit points	
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210	1
Leistungsnachweis Performance record	Written exam: 120 min	
Semester Semester	4	
Häufigkeit des Angebots Frequency of the offer	Annually in winter semester	
Dauer Duration	1 Semester	
Art der Lehrveranstaltung Type of course	Compulsory Module 4. Semester	
Besonderes Peculiarity		

Modulname Modulname	**Rapid Manufacturing Design and Technologies BA MERO**	BM15
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Jun.-Prof. Dr.-Ing. Andreas Wirtz (Modulverantwortung)	
Qualifikationsziele Qualification goals	Rapid and additive manufacturing technologies such as powder bed fusion and directed energy deposition offer new possibilities in the design of machins, tools and workpieces. E.g., through functional integration, individual components can replace entire assemblies. New functions can be fulfilled, for example, through the possibility of manufacturing internal design elements or structures. Additive manufacturing is also used in lightweight construction to produce highly resistant, lightweight structures in a material- and cost-efficient way. When designing manufacturing-compatible workpieces, various guidelines regarding rapid manufacturing should be followed in order to ensure effective and safe manufacturing and to make the best possible use of the potential offered by the technologies. In this module, students learn about the essential manufacturing processes including their advantages and disadvantages as well as areas of application. The principles of manufacturing-oriented design are explained and discussed using application-oriented examples.	
Modulinhalte Module contents	• Definitions, classification and categorization of additive manufacturing processes and rapid manufacturing • Additive manufacturing processes in the field of plastics, metals and ceramics and rapid manufacturing technology • Basics of manufacturing-oriented design, requirements and advanced possibilities in the design of workpieces to be manufactured additively	
Lehrformen Forms of teaching	Vorlesung (3 SWS) Laborpraktikum (1 SWS)	
Voraussetzungen für die Teilnahme Requirements for participation	Basic knowledge of reading of technical drawings; basic knowledge of 3D CAD software is helpful, but not required; fundamentals of Engineering Mechanics	

Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	*Supporting documents: Set of slides with solved and explained examples* *Recommended publications:* 1. Klocke, F.: Manufacturing Processes 1: Cutting. Springer Verlag, 2011, doi: 10.1007/978-3-642-11979-8. 2. Klocke, F.: Manufacturing Processes 2: Grinding, Honing, Lapping. Springer Verlag, 2009, doi: 10.1007/978-3-540-92259-9. 3. Tschätsch, H.: Applied Machining Technology, Springer Verlag, doi: 10.1007/978-3-642-01007-1. 4. Mechanical and Metal Trades Handbook, 4. Edition, Europa Verlag, 2018, ISBN 978-3-8085-1915-8. 5. Grote, Karl-Heinrich; Hefazi, Hamed: Springer Handbook of Mechanical Engineering. Springer Handbooks Series. 2021. 6. Klocke, Fritz: Manufacturing Processes 1: Cutting, Springer Verlag, 2011. 7. Klocke, Fritz: Manufacturing Processes 2: Grinding, Honing, Lapping. Springer Verlag, 2009.
Lehrbriefautor Textbook author	keiner
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.
Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 60 h + Vorbereitung 90 h = 150 Stunden = 5.0 Credit Punkte presence 60 h + preparation 90 h = 150 hours = 5.0 credit points
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210 | 1
Leistungsnachweis Performance record	Written exam (120 min)
Semester Semester	4
Häufigkeit des Angebots Frequency of the offer	Annually in winter semester
Dauer Duration	1 Semester
Art der Lehrveranstaltung Type of course	Compulsory Module 4. Semester
Besonderes Peculiarity	

Modulname Modulname	**Electronic Circuit Design BA MERO**	BM41
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Nomen Nominandum (Modulverantwortung)	
Qualifikationsziele Qualification goals	1. The students understand Boolean algebra and are able to optimize the switching functions with different methods. They know the basic combinatorial and sequential circuits and can apply their knowledge in the analysis and synthesis of digital circuits. 2. Students understand the physical, technical and mathematical fundamentals in the field of analog circuits. They are able to apply their knowledge in the analysis and synthesis of analog circuits with passive and active components. The event mainly mediates Professional competence 50 % Methodological competence 50 % System competence 0 % Social competence 0 %	

Modulinhalte Module contents	1. Introduction: Performance of modern electronics, "Silicon Roadmap" 2. Basics of Boolean algebra: sets and expressions, Boolean functions, input and output assignment, representation forms and normal forms for Boolean functions, laws and rules, minimization of Boolean functions, two- and multi-level logic, multi-valued logic 3. Basic combinatorial circuits: decoders, multiplexers, read-only memories, adders, subtractors, comparators 4. Sequential basic circuits: time dependencies and memory behavior, automaton model, representation of automaton behavior, completeness and consistency, synchronous and asynchronous automata, flip-flop, counter, data register, FIFO 5. Realization of digital circuits: parameters, CMOS circuits 6. Signals and their description; circuits and their description; Passive linear four-poles; 7. Active components: bipolar transistors, unipolar transistors, operating point adjustment; Basic analogue circuits in small-signal operation; 8. Basic feedback circuits, selected circuits and their application, Darlington circuit, bootstrap circuit, differential amplifier; 9. Operational amplifier: characteristics, feedback OPV, inverting and non-inverting amplifier; Applications OPV, LF amplifiers, analog computing circuits, adders, subtractors, explosion amplifiers, logorhythmizers, integrators, differentiators, constant current sources, rectifier circuits; Nonlinear circuits, Comparator, Schmitt trigger, Astable mutivibrator 10. Introduction to Circuit Simulation with NI Multisim
Lehrformen Forms of teaching	Vorlesung (4 SWS)
Voraussetzungen für die Teilnahme Requirements for participation	Students must be enrolled in a degree program of the Faculty of Electrical Engineering.
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	Script and various standard books of Circuit Design
Lehrbriefautor Textbook author	keiner
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.

Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 60 h + Vorbereitung 90 h = 150 Stunden = 5.0 Credit Punkte presence 60 h + preparation 90 h = 150 hours = 5.0 credit points	
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210	1
Leistungsnachweis Performance record	Written exam (120 min)	
Semester Semester	4	
Häufigkeit des Angebots Frequency of the offer	Annually in winter semester	
Dauer Duration	1 Semester	
Art der Lehrveranstaltung Type of course	Compulsory Module 4. Semester	
Besonderes Peculiarity		

Modulname Modulname	**Digital Signal Processing BA MERO**	BM42
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Prof. Dr.-Ing. Carsten Roppel (Modulverantwortung)	
Qualifikationsziele Qualification goals	You know the concepts of impulse response, convolutiom and frequency response of discrete-time LTI systems. You can work with the discrete Fourier transform and with the z transform. You can design FIR and IIR filters and you know how to use digital filter design tools. The event mainly mediates Professional competence 60 % Methodological competence 20 % System competence 20 % Social competence 0 %	
Modulinhalte Module contents	1. Introduction and Overview 2. Sampling and Quantization (Sampling Theorem, Quantization, ADC Types and Parameters) 3. Discrete-Time Signals and Systems (Discrete-Time Convolution, Discrete Fourier Transform DFT, z Transform) 4. Finite Impulse Response (FIR) Filters 5. Ininite Impulse Response (IIR) Filters 6. Representation of Numbers and Quantization of Filter Coefficients 7. Decimation and Interpolation	
Lehrformen Forms of teaching	Vorlesung (3 SWS) Laborpraktikum (1 SWS)	
Voraussetzungen für die Teilnahme Requirements for participation	Basic knowledge in signals and systems and Python is recommended.	

Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	A lecture script will be provided. Literature: 1. Downey, A. B.: Think DSP: Digital Signal Processing in Python. O'Reilly. 2. Hayes, M.: Schaums Outline of Digital Signal Processing. McGraw-Hill. 3. Lyons, R. G.: Essential Guide to Digital Signal Processing. Pearson Prentice Hall. 4. Oppenheim, A. V., Schaffer, R. W.: Discrete-time signal processing. Prentice-Hall, 1999 (deutsche Ausgabe: Zeitdiskrete Signalverarbeitung, Pearson Studium, 2004). 5. Roppel, C.: Grundlagen der Nachrichtentechnik. Hanser-Verlag, 2018.
Lehrbriefautor Textbook author	keiner
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.
Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 60 h + Vorbereitung 90 h = 150 Stunden = 5.0 Credit Punkte presence 60 h + preparation 90 h = 150 hours = 5.0 credit points
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210 | 1
Leistungsnachweis Performance record	Written exam (120 min)
Semester Semester	4
Häufigkeit des Angebots Frequency of the offer	Annually in winter semester
Dauer Duration	1 Semester
Art der Lehrveranstaltung Type of course	Compulsory Module 4. Semester
Besonderes Peculiarity	

Modulname Modulname	**German Language IV BA MERO**	BM53
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Dr. Anita Toronyi (Modulverantwortung)	
Qualifikationsziele Qualification goals	The course aims to build up a technical vocabulary and to improve the students' ability to communicate in academic and professional contexts. Upon completion of this course the students will be able: • to deal with everyday situations with predictable content in an academic or professional context using simple vocabulary, often taking longer pauses to look for words or to restart the conversation. • to generally identify the topic of conversation around them and to follow changes of topic in formal discussion related to their professional field that is conducted slowly and clearly. • to make themselves understood in an interview communicating ideas and information on familiar topics related to their academic or professional field, provided they can ask for clarification occasionally. • to understand the main facts of a simple presentation on a familiar topic when there is visual or gestural support. • to make a short presentation or announce something in front of an audience using short, well-prepared phrases. • to describe a process or to tell a story in a simple list of points. • to understand standard routine letters and to identify specific information in simpler written material they encounter. • to extract specific pieces of information from longer texts related to their field of interest or subjects of study. • to write simply about familiar topics and areas of personal interest using a very limited repertoire of words and structures.	

Modulinhalte Module contents	The course provides extended basic knowledge of German and is oriented towards the language competence level A2.2 of the Common European Framework of Reference for Languages (CEFR). The course trains all four language skills (speaking, listening, reading and writing) and covers: • lexis on topics such as: working environments, job applications and interviews, soft skills, ideas and inventions, technology, culture, environment; • grammar structures such as: the past perfect, active and passive voice, relative clauses, subordinate clauses, nominalizations, infinitive constructions, verbs with prepositions; • phonetics and listening comprehension exercises.
Lehrformen Forms of teaching	Seminar oder Übung (4 SWS)
Voraussetzungen für die Teilnahme Requirements for participation	German language skills at A2.1 level
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	Lecture script
Lehrbriefautor Textbook author	keiner
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.
Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 60 h + Vorbereitung 90 h = 150 Stunden = 5.0 Credit Punkte presence 60 h + preparation 90 h = 150 hours = 5.0 credit points
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210 | 1
Leistungsnachweis Performance record	Written exam (120 min)
Semester Semester	4
Häufigkeit des Angebots Frequency of the offer	Annually in winter semester
Dauer Duration	1 Semester
Art der Lehrveranstaltung Type of course	Compulsory Module 4. Semester

Besonderes Peculiarity	

Modulname Modulname	**Advanced Mathematics for Robotics BA MERO**	BM9
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Prof. Dr.-Ing. habil. Carsten Behn (Modulverantwortung)	
Qualifikationsziele Qualification goals	With focus on real problems from the engineering world, e.g., from Physics or Mechanics or Robotics, the student shall be acquainted with the description and modeling of mathematical problems of a higher level. They will be able to describe the movement of robots using the matrix-vector representation and to analyze this movement in investigating the arising matrices from an algebraic point of view. Coming from dynamics, they will be able to investigate the dynamical behavior of robotic systems in observing eigenvalues and eigenvectors of the corresponding systems. Moreover, they apply the absorbed knowledge on linear systems to transfer it to the treatment of nonlinear systems (stability analysis using the Theorem of Hartman & Grobman). Finally, some steps towars linear optimization and the treatment of partial differential equations are introduced.	
Modulinhalte Module contents	• Matrix Algebra (Eigenvectors, Eigenvalues, Transformations in Application to Robotic Systems) • Set of linear ODEs: solution and stability (application of eigenvalues and eigenvectors) • Set of nonlinear ODEs: linearization and Theorem of Hartman & Grobman • Introduction to (linear) Optimization • Introduction to partial differential equations The teaching strategy is a mixture of lectures (using slides and the blackboard) and problemsolving tutorials (incorporating computer aided calculations using Matlab and Maple). The format of lectures is conventional, however, the atmosphere is informal, and interaction and discussion is normal. Students are encouraged to ask questions in the lectures. In the tutorials, the students work on problems to practise and apply the methods introduced in the lectures.	
Lehrformen Forms of teaching	Vorlesung oder Übung (4 SWS)	

Voraussetzungen für die Teilnahme Requirements for participation	The successful completion of the courses „Mathematics for Engineers 1 & 2“ would be beneficial.
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	• Kreyszig: Advanced Engineering Mathematics, Wiley, 9th edition, 2006 • Bird: Higher Engineering Mathematics, Routledge, Taylor & Francis Group, 8th edition, 2017 • Grewal: Higher Engineering Mathematics, Khanna Publisher, 4th edition, 2010 • Fox and Bolton: Mathematics for Engineers and Technologists, Elsevier, 2002 • Batty: Essential Engineering Mathematic, BookBoon, 2011
Lehrbriefautor Textbook author	keiner
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.
Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 60 h + Vorbereitung 90 h = 150 Stunden = 5.0 Credit Punkte presence 60 h + preparation 90 h = 150 hours = 5.0 credit points
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210 | 1
Leistungsnachweis Performance record	Oral exam (45 min). Note: In case of a third attempt, the exam can be performed as an oral exam (60 min.) in agreement with the corresponding professor to pass this course.
Semester Semester	4
Häufigkeit des Angebots Frequency of the offer	Annually in summer semester
Dauer Duration	1 Semester
Art der Lehrveranstaltung Type of course	Elective module 4. Semester: 1 to be chosen
Besonderes Peculiarity	

Modulname Modulname	**Microelectronics Technologies BA MERO**	BM34
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Prof. Dr.-Ing. Roy Knechtel (Modulverantwortung)	
Qualifikationsziele Qualification goals	Students understand all the important steps in the technology for manufacturing integrated circuits on silicon chips, including the associated monitoring and control concepts (statistical process control). They understand the processes in production clean rooms and know the most important types of equipment and their mode of operation. The course mainly imparts Technical competence 80 Methodological competence 20 % System competence 0 % Social competence 0	

Modulinhalte Module contents	Technologies of microelectronics: • Moore's law and its extensions • Business models of the semi-conductor industry • Clean rooms: design, operation, special features • single crystalline silicon, production of single crystalline wafers, epitaxial and SOI wafers • thermal oxidation processes, • doping processes • Thin film deposition (polysilicon, oxides, nitrides, metallization, silicides; different processes in each case) • photolithography • etching techniques • Cleaning steps • Total CMOS technology and process integration • Statistical process control and inline measurement • PCM test and wafer probing • Yield and defect density • Application examples The lectures are mainly designed to hold them with the help of the blackboard. The number of slides is limited to a minimum. Individual focal points are supported by lecture experiments. Lecture / Exercise 4 SWS all lectures
Lehrformen Forms of teaching	Vorlesung oder Übung (4 SWS)
Voraussetzungen für die Teilnahme Requirements for participation	Students must be enrolled in a degree program in the Electrical Engineering Department.
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	Karim Abbas: Kindle Ausgabe Handbook of Digital CMOS Technology, Circuits, and Systems All copies of slides as well as special literature and learning programs will be provided via StudIP
Lehrbriefautor Textbook author	keiner
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.

Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 60 h + Vorbereitung 90 h = 150 Stunden = 5.0 Credit Punkte presence 60 h + preparation 90 h = 150 hours = 5.0 credit points	
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210	1
Leistungsnachweis Performance record	Designation of the subject examination: Measurement written examination (PS), 120 minutes. For the participation in the written exam a registration according to the study and examination regulations of the faculty is required.	
Semester Semester	4	
Häufigkeit des Angebots Frequency of the offer	Annually in winter semester	
Dauer Duration	1 Semester	
Art der Lehrveranstaltung Type of course	Elective module 4. Semester: 1 to be chosen	
Besonderes Peculiarity		

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Modulname Modulname	**Simulation Driven Design BA MERO**	BM5
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Prof. Dr.-Ing. Andreas Dietzel (Modulverantwortung)	
Qualifikationsziele Qualification goals	Using CAD-integrated or CAD-related simulation tools, students learn how to create: • parameterized design variants including data management • kinematic simulation models of selected mechanisms, in order to visualise their movements, to design the movement properties according to the requirements (synthesis) and to derive loads or constraints • structural-mechanical simulation models based on the finite element method, in order to analyse design variants of simple parts with regard to occurring deformation and stress states	
Modulinhalte Module contents	This course provides the basics and advantages of Live-Simulation (design-related simulation), a method for using CAE-technologies directly indside of the design process/by the design engineer, to test ideas for their feasibility and compare concepts/variants of parts and assemblies objectively. The development process can thus be made faster and more reliable by eliminating uncertainties during the early designphase. The software systems PTC CREO Parametric and CREO SIMULATE resp. ANSYS Workbench are used in the course. Previous knowledge of the programmes mentioned is advantageous, but not required.	
Lehrformen Forms of teaching	Laborpraktikum (4 SWS)	
Voraussetzungen für die Teilnahme Requirements for participation	basic knowledge of 3D CAD software, fundamentals of Engineering Mechanics	
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	**recommended publications:** • Creo Parametric Online Help • ANSYS theory manual and elements documentation	
Lehrbriefautor Textbook author	keiner	
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.	
Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 60 h + Vorbereitung 90 h = 150 Stunden = 5.0 Credit Punkte presence 60 h + preparation 90 h = 150 hours = 5.0 credit points	

ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210	1
Leistungsnachweis Performance record	practical examination at the computer (120 min)	
Semester Semester	5	
Häufigkeit des Angebots Frequency of the offer	Annually in summer semester	
Dauer Duration	1 Semester	
Art der Lehrveranstaltung Type of course	Compulsory Module 5. Semester	
Besonderes Peculiarity		

Modulname Modulname	**Rapid Manufacturing Design**	BM13
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Prof. Dr. Carsten Löser (Modulverantwortung)	
Qualifikationsziele Qualification goals	To learn the current tasks and the situation of the work preparation/ manufacturing process design. Acquisition of applicable basic knowledge for data management, time management and field-proven planning systematics. Understanding the principles of assembly-oriented product design and assembly planning as well as the cost-oriented planning of parts production. Acquisition of complex planning experiences. To acquire basic knowledge for the time management of corporate processes. Getting to know the technical -methodical foundations and rules for logical modeling of manufacturing processes. For a better understanding, this is consolidated with practical examples. On completion of this course, the students should have some background knowledge and a familiarization with the tasks of work preparation and the plan-ning of manufacturing processes. They should understand the necessary princi-ples for the planning and detailing of processes for the parts manufacturing and assembly.	
Modulinhalte Module contents	Tasks, contents and development of work preparation/manufacturing process design. Methods and techniques for the planning of parts production and assembly, pro-duction processes, assembly processes, work preparation, planning in parts manufacturing processes/assembly, production-oriented construction, selection of raw parts, selection of suitable production processes and their order, comparison of variants, rough and detailed planning of parts production and assembly processes, selection of machines and tools, determination of technological parameters and times, analysis and synthesis of default times use of default times. inspection planning, ergonomics, work safety	
Lehrformen Forms of teaching	Vorlesung (4 SWS)	
Voraussetzungen für die Teilnahme Requirements for participation	Basic knowledge in process design and ergonomics, manufacturing, construction, engineering internship favorable	

Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	It will be announced in the course	
Lehrbriefautor Textbook author	keiner	
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.	
Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 60 h + Vorbereitung 90 h = 150 Stunden = 5.0 Credit Punkte presence 60 h + preparation 90 h = 150 hours = 5.0 credit points	
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210	1
Leistungsnachweis Performance record	Written examen (120 min)	
Semester Semester	5	
Häufigkeit des Angebots Frequency of the offer	Annually in the summer semester	
Dauer Duration	1 Semester	
Art der Lehrveranstaltung Type of course	Compulsory Module 5. Semester	
Besonderes Peculiarity		

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Modulname Modulname	**Drives Technology BA MERO**	BM43
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Nomen Nominandum (Modulverantwortung)	
Qualifikationsziele Qualification goals	Getting to know and understanding electric drives with DC and three-phase machines. Apply the knowledge to selected examples.	
Modulinhalte Module contents	The event mainly mediates Professional competence 30 % Methodological competence 30 % System competence 30 % Social competence 10 %	
Lehrformen Forms of teaching	Vorlesung (2 SWS) Übung (1 SWS) Laborpraktikum (1 SWS)	
Voraussetzungen für die Teilnahme Requirements for participation	Students must be enrolled in a degree program of the Faculty of Electrical Engineering.	
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	Lecture notes and standard literature	
Lehrbriefautor Textbook author	keiner	
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.	
Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 60 h + Vorbereitung 90 h = 150 Stunden = 5.0 Credit Punkte presence 60 h + preparation 90 h = 150 hours = 5.0 credit points	
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210	1
Leistungsnachweis Performance record	Written exam (120 min)	
Semester Semester	5	

Häufigkeit des Angebots Frequency of the offer	Annually in Summer Semester
Dauer Duration	1 Semester
Art der Lehrveranstaltung Type of course	Compulsory Module 5. Semester
Besonderes Peculiarity	

Modulname Modulname	**Human Machine Interaction BA MERO**	BM44
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Prof. Dr.-Ing. Maria Schweigel (Modulverantwortung)	
Qualifikationsziele Qualification goals	Content of lecture are technics and methods for design of human machine interfaces of computational technical systems. The information processing of human (physiological and psychological basics, models and action processes), the technical realization of interfaces (input- and output devices, interaction styles) are part of the lecture. Furthermore user oriented development processes, evaluation technics and standards for human machine interaction were introduced. The lecture convey: professional competence 60% method competence 20% system competence 10% social competence 10%	

Modulinhalte Module contents	The students get an overview of human machine interaction for acquire and apply even more knowledge about design and development of interactive interfaces for a variety of applications under consideration of agronomical conditions. They acquire knowledge for realizing used friendly interactive systems with actual technologies but should be able to create new interaction possibilities for research and development under consideration of ergonomically and ethnical aspects. • Information processing of human (models, physical and psychical basics, human sense, action processes) • Design basics and design methods • Input- and output devices for computer, embedded systems and mobile devices • Standards for design of interfaces • Basics and examples for design of user interfaces (text dialogs, formulas, menu systems, graphical interfaces, internet interfaces, audio dialog systems, haptic interaction, gestures) • Methods for models of user interfaces (abstract description of interaction, including for requirement analyze and software design) • Evaluation of systems for human machine interaction (tools, methods, performance measuring, checklists)
Lehrformen Forms of teaching	Vorlesung (4 SWS)
Voraussetzungen für die Teilnahme Requirements for participation	
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	Script for lecture
Lehrbriefautor Textbook author	keiner
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.
Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 60 h + Vorbereitung 90 h = 150 Stunden = 5.0 Credit Punkte presence 60 h + preparation 90 h = 150 hours = 5.0 credit points
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210 | 1

Leistungsnachweis Performance record	Written exam (120 min) Accepted aid: 1 DIN A4 paper with notes, calculator (not programmable)
Semester Semester	5
Häufigkeit des Angebots Frequency of the offer	Annually in Summer Semester
Dauer Duration	1 Semester
Art der Lehrveranstaltung Type of course	Compulsory Module 5. Semester
Besonderes Peculiarity	

Modulname Modulname	**German Language V BA MERO**	BM54
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Ramona Alina Petschauer (Modulverantwortung)	
Qualifikationsziele Qualification goals	The course aims to build up and improve technical vocabulary and to improve the students' ability to communicate in written and speech in academic and professional contexts. Upon completion of this course the students will be able: • to understand straightforward factual information about common everyday, study or job-related topics, identifying both general messages and specific details, provided speech is clearly articulated in a generally familiar accent. • to understand simple technical information and follow detailed directions. • to generally follow the main points of extended discussions around them, provided speech is clearly articulated in standard dialect. • to read straightforward factual texts on subjects related to their field of interest and study with a satisfactory level of comprehension. • to scan longer texts in order to locate desired information, and gather information from different parts of a text, or from different texts in order to fulfil a specific task. • to communicate with some confidence on familiar routine and non-routine matters related to their interests and professional field. • to exchange, check and confirm information, deal with less routine situations and explain why something is a problem and to express thoughts on more abstract, cultural topics. • to understand clearly structured lectures on topics from their interest or professional field when standard language is clearly spoken. • to realize different intentions in their written communication (e.g. pass on and explain technical information, tasks or problems, write or answer a simple official letter).	

Modulinhalte Module contents	The course provides knowledge of German in lexis, grammar and phonetics and is oriented towards the language competence level B1 of the Common European Framework of Reference for Languages (CEFR). The course trains all four language skills (speaking, listening, reading and writing) and covers: • lexis on topics such as: branches of engineering, engineering materials/properties of materials, tools, mechanisms and forces in engineering, measuring, monitoring and control, describing processes; • grammar structures such as: passive voice with modal verbs, the tenses of the indicative, subjunctive I and II, verbs with prepositions, subordinate clauses, adjectives, adverbs, prepositions; • phonetics and listening comprehension exercises.
Lehrformen Forms of teaching	Seminar oder Übung (4 SWS)
Voraussetzungen für die Teilnahme Requirements for participation	German language skills at A2.2 level
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	Lecture script
Lehrbriefautor Textbook author	keiner
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.
Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 60 h + Vorbereitung 90 h = 150 Stunden = 5.0 Credit Punkte presence 60 h + preparation 90 h = 150 hours = 5.0 credit points
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210 | 1
Leistungsnachweis Performance record	Written exam (120 min)
Semester Semester	5
Häufigkeit des Angebots Frequency of the offer	Annually in Summer Semester
Dauer Duration	1 Semester

Art der Lehrveranstaltung Type of course	Compulsory Module 5. Semester
Besonderes Peculiarity	

Modulname Modulname	**Factory Planning & PPC BA MERO**	BM1
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Prof. Dr. Lutz Huxholl (Modulverantwortung) Prof. Dr. Carsten Löser (Modulverantwortung)	
Qualifikationsziele Qualification goals	The module gives an overview about the activities to be executed when planning a new production site respectively optimising an existing site. It covers aspects to be considered for the location of a new site and the design and the layout of the buildings and processes to be used. The organisation of the processes within the site will also be illustrated. The students are also taught knowledge of industrial production planning and control (PPC) for the manufacturing of goods. In doing so, they get to know important basic terms and methods that are required for application in practice, such as the planning processes and planning stages as well as the opposing goals of the PPC, problems and solution methods. Another goal is the ability to assess the areas of application, significance and limits of the methods used and to be able to apply the methods from the above-mentioned areas of PPC to corresponding tasks.	
Modulinhalte Module contents	Coming from the strategic business planning, the core activities related to factory planning are explained. Key success factors for a factory design fulfilling the market requirements in terms of economic targets, timing and flexibility for model and volume changes are explained. Main areas of production planning and control: • Development of the PPC • Goals of the PPC • Production program planning • Production requirements planning • In-house production planning and control • Current developments	
Lehrformen Forms of teaching	Vorlesung (3 SWS) Übung (1 SWS)	
Voraussetzungen für die Teilnahme Requirements for participation	Basic knowledge of factory operations Basic knowledge of the factory process (procedures and planning, e.g. from the internship) desirable	

Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	• Wiendahl, H-P.; Reinhardt, J.; Nyhuis, P.: Handbook Factory Planning and Design • Schenk, M.; Wirth, S.; Müller, E.: Factory Planning Manual: Situation-Driven Production • Rogalski, S.: Flexibility Measurement in Production Systems: Handling Uncertainties in Industrial Production • Erlach, K.: Value Stream Design: The Way Towards a Lean Factory • Gisi, P. J.: Fundamentals of Daily Shop Floor Management: A Guide for Manufacturing Optimization and Excellence • Crowson, R.: Factory Operations: Planning and Instructional Methods • Sagegg, O. J.; Alfnes, E.: ERP Systems for Manufacturing Supply Chains • Magal, S. R.; Word, J.: Integrated Business Processes with ERP Systems • Bailey, M.: How to implement a manufacturing system: Best practices and pitfalls when implementing an MRP/ERP system • Christopher, M.: Logistics and Supply Chain Management: Logistics & Supply Chain Management • Roser, C.: All About Pull Production: Designing, Implementing, and Maintaining Kanban, CONWIP, and other Pull Systems in Lean Production
Lehrbriefautor Textbook author	keiner
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.
Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 60 h + Vorbereitung 90 h = 150 Stunden = 5.0 Credit Punkte presence 60 h + preparation 90 h = 150 hours = 5.0 credit points
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210 | 1
Leistungsnachweis Performance record	Written exam 120 min
Semester Semester	5
Häufigkeit des Angebots Frequency of the offer	Annually in summer semester
Dauer Duration	1 Semester
Art der Lehrveranstaltung Type of course	Elective module 5. Semester: 1 to be chosen

Besonderes Peculiarity	

Modulname Modulname	**Artificial Intelligence BA MERO**	BM32
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Prof. Dr.-Ing. Silvio Bachmann (Modulverantwortung)	
Qualifikationsziele Qualification goals	Students understand basic concepts and methods of Artificial Intelligence (AI). You learn to understand different AI methods and have practice work with Python. Lesson is divided in Technical information 60 % Method knowledge 30 % System competence 10 %	
Modulinhalte Module contents	Parts - Theory • Introduction • Set of AI methods • Classification Problems • Propositional Logic • Predicate Logic • Search Problems • Fuzzy Logic • Bayes Networks • Support Vector Machines • Neural Networks • Machine Learning - Practice Work with Python • Overview and Basics • Useful Packages • Creating Examples based on Theory	
Lehrformen Forms of teaching	Vorlesung (4 SWS)	
Voraussetzungen für die Teilnahme Requirements for participation	Basic knowledge in computing	

Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	Script	
Lehrbriefautor Textbook author	keiner	
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.	
Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 60 h + Vorbereitung 90 h = 150 Stunden = 5.0 Credit Punkte presence 60 h + preparation 90 h = 150 hours = 5.0 credit points	
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	5.00 5/210	1
Leistungsnachweis Performance record	Written examination 120 min.	
Semester Semester	5	
Häufigkeit des Angebots Frequency of the offer	Annually in winter semester	
Dauer Duration	1 Semester	
Art der Lehrveranstaltung Type of course	Elective module 5. Semester: 1 to be chosen	
Besonderes Peculiarity		

Modulname Modulname	**Robotics Lab BA MERO**	BM12
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Prof. Dr.-Ing. Frank Schrödel (Modulverantwortung)	
Qualifikationsziele Qualification goals	Students shall understand the fundamentals as well as current trends of applied robotics technology in modern applications. A special focus of the lecture is on utilizing the rapid control prototyping for robotics applications. Therefore, students have the chance in differt labs to select and synthesize suitable robotics concepts for given problems. Moreover, they get the cance to programm robotics PLCs from different suppliers.	
Modulinhalte Module contents	- Application Areas of Robotics - Robot Programing - Robot Kinematics - Process Models for Engineering (Rapide Control Prototyping) - System Simulation and Validation	
Lehrformen Forms of teaching	Vorlesung (1 SWS) Laborpraktikum (1 SWS)	
Voraussetzungen für die Teilnahme Requirements for participation	- Application Areas of Robotics - Robot Programing - Robot Kinematics - Process Models for Engineering (Rapide Control Prototyping) - System Simulation and Validation - Controller Design and Outlook on Modern Control Engineering Methods	
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	Textbooks on Robotics	
Lehrbriefautor Textbook author	keiner	
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.	
Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 30 h + Vorbereitung 45 h = 75 Stunden = 2.5 Credit Punkte presence 30 h + preparation 45 h = 75 hours = 2.5 credit points	

ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	2.50 2,5/210	1
Leistungsnachweis Performance record	Individual oral examination	
Semester Semester	6	
Häufigkeit des Angebots Frequency of the offer	Annually in winter semester	
Dauer Duration	1 Semester	
Art der Lehrveranstaltung Type of course	Compulsory Module 6. Semester	
Besonderes Peculiarity	Dieses Modul wird mit 2,5 CP bewertet.	

Modulname Modulname	**Advanced Circuit Design BA MERO**	BM45
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Nomen Nominandum (Modulverantwortung)	
Qualifikationsziele Qualification goals	The students understand the physical, technical and mathematical basics in the design of electronic assemblies. They are familiar with the technological implementation possibilities and manufacturing processes of printed circuit boards and hybrid circuits as carriers of electronic assemblies as well as the necessary assembly technologies. They are able to assess the suitability of the various technologies for specific applications and can dimension and design the electronic assemblies. The event mainly mediates Professional competence 50 % Methodological competence 40 % System competence 10 % Social competence 0 %	
Modulinhalte Module contents	1. Heating phenomena in electronic devices: types of heat transfer, sizing of cooling arrangements, thermal housing sizing; 2. Design and manufacturing processes of electronic component carriers: printed circuit boards, hybrid circuits; 3. Surface Mount Technology (SMT); 4. Joining technologies: soldering, bonding, gluing; 5. CAEE-Prozess;	
Lehrformen Forms of teaching	Vorlesung (1 SWS) Laborpraktikum (1 SWS)	
Voraussetzungen für die Teilnahme Requirements for participation	Students must be enrolled in a degree program of the Faculty of Electrical Engineering.	
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	Lecture notes and standard literature	
Lehrbriefautor Textbook author	keiner	

Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.	
Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 25 h + Vorbereitung 50 h = 75 Stunden = 2.5 Credit Punkte presence 25 h + preparation 50 h = 75 hours = 2.5 credit points	
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	2.50 2,5/210	1
Leistungsnachweis Performance record	Written exam (60 min)	
Semester Semester	6	
Häufigkeit des Angebots Frequency of the offer	Annually in winter semester	
Dauer Duration	1 Semester	
Art der Lehrveranstaltung Type of course	Compulsory Module 6. Semester	
Besonderes Peculiarity	Für das Modul gibt es 2,5 CP	

Modulname Modulname	**Quality Management BA MERO**	BM14
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Prof. Dr. Lutz Huxholl (Modulverantwortung) Prof. Dr.-Ing. Roy Knechtel (Modulverantwortung)	
Qualifikationsziele Qualification goals	The students learn the basics of quality management. After finishing the course, they shall be able to accompany and/or lead quality management projects within a company. In particular, they should be enabled to identify and assess risks, develop measures to reduce risks, and generally embed risk-based thinking in a company. After completing the lecture, students will know how to use error prevention techniques based on common quality standards and they will be able to work on appropriate measures when quality incidents occur.	
Modulinhalte Module contents	The content of the lecture includes the basics of quality management, a selection of quality tools and their application in practice. Based on the cross-industry standard ISO 9001, requirements for quality management systems are explained and aspects that are required for the successful management of industrial companies are considered. The practical part is the link between the standard and the company practice. Topics such as leadership, target indicators, complaint management, escalation procedures, lessons learned, control of nonconforming parts, product and process changes, deviation and concession and other relevant topics are covered here.	
Lehrformen Forms of teaching	Vorlesung (1 SWS) Vorlesung (1 SWS)	
Voraussetzungen für die Teilnahme Requirements for participation	(none)	

Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes	• Summers, Donna C.S.; Quality Management: Creating and Sustaining Organziational Effectiveness • Kehoe, D. F.; The Fundamentals of Quality Management • Chapman & Hall; Total Quality Management: The Key to Business Improvement • Mizuno, S.; Management for Quality Improvement • Berényi, L.; Fundamentals of Quality Management
Lehrbriefautor Textbook author	keiner
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.
Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 25 h + Vorbereitung 50 h = 75 Stunden = 2.5 Credit Punkte presence 25 h + preparation 50 h = 75 hours = 2.5 credit points
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	2.50 2,5/210 | 1
Leistungsnachweis Performance record	Written exam 60 min (two parts)
Semester Semester	6
Häufigkeit des Angebots Frequency of the offer	Annually in summer semester
Dauer Duration	1 Semester
Art der Lehrveranstaltung Type of course	Compulsory Module 6. Semester
Besonderes Peculiarity	

HOCHSCHULE SCHMALKALDEN
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Modulname Modulname	**Career coaching, scientific writing and presentation skills BA MERO**	BM22
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Persönliche:r Hochschulbetreuer:in (Modulverantwortung)	
Qualifikationsziele Qualification goals	The lecture focuses on the intersection of international higher education and labour market outcomes/graduate employability. We incorporate the latest academic knowledge in order to form the lecture in a kind of Germany Career Kickstarter program. As such, we establish skills to prepare a successfully preparation for launching a career in Germany. Moreover, fundamental techniques for scientific writing and presenting is focussed.	
Modulinhalte Module contents	The lecture is about getting acquainted with planning, applying, and working in Germany. This crash course will prepare you to put together excellent application materials and avoid many of the common mistakes internationals make. In addition, course offers some fundamental tips and techniques for effectively writing and presenting scientific information.	
Lehrformen Forms of teaching	Vorlesung (2 SWS)	
Voraussetzungen für die Teilnahme Requirements for participation		
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes		
Lehrbriefautor Textbook author	keiner	
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.	
Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 25 h + Vorbereitung 50 h = 75 Stunden = 2.5 Credit Punkte presence 25 h + preparation 50 h = 75 hours = 2.5 credit points	
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	2.50 2,5/210	1
Leistungsnachweis Performance record	Written exam (60 min) and/other presentation	

Semester Semester	6
Häufigkeit des Angebots Frequency of the offer	Annually in winter semester
Dauer Duration	1 Semester
Art der Lehrveranstaltung Type of course	Compulsory Module 6. Semester
Besonderes Peculiarity	There are 2,5 CP for the module

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Modulname Modulname	**Engineering Internship part 1 BA MERO**	BM23
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Persönliche:r Hochschulbetreuer:in (Modulverantwortung)	
Qualifikationsziele Qualification goals	The future mechanical engineers should become familiar with modern development and production methods, gain insight into the organization and social structure of a company and be introduced to the professional activity of a mechanical engineer.	
Modulinhalte Module contents	The students should receive practical training on clearly defined concrete projects of the company and thus develop constructive developments as well as production-technical and organizational solutions using concrete examples and propose them for operational implementation.	
Lehrformen Forms of teaching		
Voraussetzungen für die Teilnahme Requirements for participation	Only those who can prove 60 credit points to the internship office of the department at the beginning of the engineering internship and name a suitable internship can be admitted to the engineering internship. An engineering internship completed without admission will not be recognized.	
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes		
Lehrbriefautor Textbook author	keiner	
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.	
Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 240 h + Vorbereitung 360 h = 600 Stunden = 20.0 Credit Punkte presence 240 h + preparation 360 h = 600 hours = 20.0 credit points	
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	20.00 20/210	1
Leistungsnachweis Performance record	Between report	
Semester Semester	6	
Häufigkeit des Angebots Frequency of the offer	Annually in winter semester	

Dauer Duration	8 Weeks/
Art der Lehrveranstaltung Type of course	Compulsory Module 6. Semester
Besonderes Peculiarity	Before the start of the engineering internship, students have to choose a professor from the university as a supervisor, and the internship topic is confirmed. If necessary, additional supervisors can be appointed. At least 8 weeks of engineering project work in a company of your choice that is suitable for the field of study. The engineering internship is regulated on the basis of a training contract between the students and the internship and is supervised by a company supervisor and a professor from the Schmalkalden University of Applied Sciences.

Modulname Modulname	**Engineering Internship part 2 and colloquium BA MERO**	BM24
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Persönliche:r Hochschulbetreuer:in (Modulverantwortung)	
Qualifikationsziele Qualification goals	The module includes the second part of the internship, see module description Bachelor Internship. On the other hand, it includes the presentation of the internship results.	
Modulinhalte Module contents	In the second part of the internship, the concepts developed are implemented and critically analyzed. In addition, the internship report will be finalized. The defense of the internship results is a presentation of the internship work in front of the supervisors, followed by a discussion with the supervisors.	
Lehrformen Forms of teaching		
Voraussetzungen für die Teilnahme Requirements for participation	Engineering Internship part 1 BA MERO	
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes		
Lehrbriefautor Textbook author	keiner	
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.	
Arbeitsaufwand/Gesamtworkload Workload/Total workload	Präsenzzeit 240 h + Vorbereitung 210 h = 450 Stunden = 15.0 Credit Punkte presence 240 h + preparation 210 h = 450 hours = 15.0 credit points	
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	15.00 15/210	1
Leistungsnachweis Performance record	Report and oral examination	
Semester Semester	7	
Häufigkeit des Angebots Frequency of the offer	annualy in Summer Semester	
Dauer Duration	8 Weeks/	

Art der Lehrveranstaltung Type of course	Compulsory Module 7. Semester
Besonderes Peculiarity	

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Modulname Modulname	**Bachelor Thesis BA MERO**	BM20
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Persönliche:r Hochschulbetreuer:in (Modulverantwortung)	
Qualifikationsziele Qualification goals	The main goal is to solve a complex engineering task in operational practice. In doing so, the systematic approach is to be carried out and consolidated within the framework of the engineering working method. The students must be able to find a solution to the problems using suitable methods. Solution finding, solution comparison and solution implementation must be mastered. Basic correlations between the execution and evaluation of the experiment should be known. The students should be able to evaluate and document self-developed results.	
Modulinhalte Module contents	Independent processing of a complex task with a predominantly mechanical engineering background. Comprehensive task analysis with development of basic solutions. If necessary, comparison of variants for the development of a preferred solution. Implementation according to the task, if necessary with test samples/prototype creation and testing, evaluation and presentation of the results. Consideration of economic and social/personnel impacts. Written presentation of task processing/results.	
Lehrformen Forms of teaching	Selbständige betreute Arbeit	
Voraussetzungen für die Teilnahme Requirements for participation	At least 180 credit points from modules (Bachelor's degree program)	
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes		
Lehrbriefautor Textbook author	keiner	
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.	
Arbeitsaufwand/Gesamtworkload Workload/Total workload	Selbsstudium 720 h = 720 Stunden = 24.0 Credit Punkte presence 240 h + preparation 210 h + independent work 720 h = 720 hours = 24.0 credit points	

ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	12.00 12/210	1
Leistungsnachweis Performance record		
Semester Semester	7	
Häufigkeit des Angebots Frequency of the offer	Annually in summer semester	
Dauer Duration	12 Weeks/	
Art der Lehrveranstaltung Type of course	Compulsory Module 7. Semester	
Besonderes Peculiarity		

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Modulname Modulname	**Colloquium BA MERO**	BM21
Modulverantwortlicher/ Modulverantwortliche Module responsibility	Persönliche:r Hochschulbetreuer:in (Modulverantwortung)	
Qualifikationsziele Qualification goals	In addition to working on the Bachelor's thesis and building on the methodological and social skills acquired in the Bachelor's programme, students should become familiar with the principles of scientific work and the presentation of results. The design principles of scientific work should be implemented concretely, unambiguously and transparently. Knowledge and experience for the evaluation of concepts, project results, design services, planning variants and other scientific and technical work are acquired. Skills and experience for the presentation of practice-related work results are built up step by step.	
Modulinhalte Module contents	Classification of a task in an operational environment and assignment to engineering sub-disciplines. Optimal delimitation of a given problem in terms of content and quantity. Possibilities of obtaining and presenting necessary data and data collections in a practical way. Selection and transparent use of evaluation methods as well as variants of the presentation of work results with the selection of the individually optimal method. Training in problem solving and conversational skills, speaking style and conflict behavior. Personal time management and optimization of personal presentation.	
Lehrformen Forms of teaching	Kolloquium	
Voraussetzungen für die Teilnahme Requirements for participation	at least 207 credit points from modules (Bachelor's degree program)	
Literatur/multimediale Lehr- und Lernprogramme Further readings/Learning programmes		
Lehrbriefautor Textbook author	keiner	
Verwendbarkeit Usability	Mechatronics & Robotics 210 CP B.Eng.	

Arbeitsaufwand/Gesamtworkload Workload/Total workload	Selbsstudium 90 h = 90 Stunden = 3.0 Credit Punkte presence 240 h + preparation 210 h + independent work 90 h = 90 hours = 3.0 credit points	
ECTS und Gewichtung der Note in der Gesamtnote ECTS and weighting in overall grade	3.00 3/210	1
Leistungsnachweis Performance record	Colloquium	
Semester Semester	7	
Häufigkeit des Angebots Frequency of the offer	As required in the summer or winter semester	
Dauer Duration	60 min	
Art der Lehrveranstaltung Type of course	Compulsory Module 7. Semester	
Besonderes Peculiarity		

Mechatronics & Robotics (B.Eng.)

Module	ECTS	V	Ü	L	Σ	ECTS	Art der Prüfungsleistung
Compulsory module 1. Semester					28		
Mathematics I	5	4	2				Klausur
Engineering Physics	5	4	2				Klausur
Measurement	5	4					Klausur
Electrical Engineering I	5	4					Klausur
Computer/Programming I	5	4					Klausur
German Language I	5		4			30	Klausur
Compulsory module 2. Semester					26		
Mathematics II	5	4	2				Klausur
Manufacturing Processes	5	3		1			Klausur
Automation I	5	4					Klausur
Electrical Engineering II	5	4					Klausur
Computer/Programming II	5	4					Klausur
German Language II	5		4			30	Klausur
Compulsory module 3. Semester					26		
Mechanical Design I	5	2	1	1			Klausur
Dynamics & Robotics	5	4					Klausur
Automation II	5	4					Klausur
Sensors	5	4					Klausur
German Language III	5		4				Klausur
Elective module 3. Semester: 1 to be chosen							
Materials Technology	5	2		2			Klausur
Communication Networks		4				30	Klausur
Compulsory module 4. Semester					24		
Mechanical Design II	5	2	1	1			Klausur
Rapid Manufacturing Design and Technologies	5	3		1			Klausur
Electronic Circuit Design	5	4					Klausur
Digital Signal Processing	5	3		1			Klausur
German Language IV	5		4				Klausur
Elective module 4. Semester: 1 to be chosen							
Advanced Math for Robotics	5	4					Klausur
Microelectronics Technology		4				30	Klausur
Compulsory module 5. Semester					24		
Simulation Driven Design	5	4					Klausur
Manufacturing Process Design	5	4					Klausur
Drives Technology	5	2	1	1			Klausur
Human Machine Interaction	5	4					Klausur
German Language V	5		4				Klausur
Elective module 5. Semester: 1 to be chosen							
Factory Planning and PPC	5	2		2			Klausur
Arctifical Intelligence		4				30	Klausur
Compulsory module 6. Semester					8		
Robotics Lab	2,5	1		1			mündliche Einzelprüfung
Advanced Circuit Design	2,5	1		1			Klausur
Quality Management	2,5	2					Klausur
Career coaching, scientific writing and presentation skills	2,5	2					Klausur
Engineering Internship part 1	20					30	Zwischenreport
Compulsory module 7. Semester							
Engineering Internship part 2 and colloquium	15						Report u. mündl. Prüfung
Bachelor Thesis	12						Bachelorarbeit
Colloquium	3					30	mündliche Prüfung