Appendix A: Course Schedule

for the study programme Electrical Engineering M.Eng.

Please note: The German version of this document is the legally binding version. The English translation provided here is for information purposes only.

Specialisation: Networked Electronic Systems

Winter semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
2026	Electrical Power Management	EPM	2	1	0	1	0	6
2021	Microcontrollers and Applications	MIC	2	1	0	1	0	6
2027	Sensor Systems	SSY	2	1	0	1	0	6
2018	Theoretical Electrical Engineering	TET	2	2	0	0	0	6
9026	Elective Module	WM				0		6
							Total CP:	30
Summer semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
2006	Management Skills	MMK	2	2	0	0	0	6
2019	Measuring Systems	MSS	2	1	0	0	0	6
2020	Nonlinear Control Systems	NLR	2	1	0	1	0	6
9026	Elective Module	WM				0		6
2028	Wide Area Networks and IT Security	WIS	2	1	0	1	0	6
							Total CP:	30
Third semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
2033	Colloquium	MKO	0	0	0	0	0	6
2034	Master Thesis	MA	0	0	0	0	0	24
							Total CP:	30

Abbreviations of the teaching forms: L = lecture, ST = tuition in seminars, E = exercise, S = seminar, P = practical, SSS = supervised self-study (all data in semester credit hours);
CP = credit points
W/S = winter/summer semester

Elective Modules Electrical Engineering M.Eng.									
Module number	Module title	Module ID	W/S	L	ST	E	P/S	SSS	CP
2024	Project 1	PRE1	S	0	0	0	1	0	6
2031	Project 2	PRE2	W	0	0	0	1	0	6
2025	Compulsory Elective 1	WPF1	S	0	4	0	0	0	6
2032	Compulsory Elective 2	WPF2	W	0	4	0	0	0	6

Appendix B: Course Schedule

for the study programme Electrical Engineering M.Eng.

Please note: The German version of this document is the legally binding version. The English translation provided here is for information purposes only.

Specialisation: Intelligent Energy Systems

Winter semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
2026	Electrical Power Management	EPM	2	1	0	1	0	6
2029	Intelligent Energy Systems	IES	2	1	0	1	0	6
2030	Human-Machine Interaction	MMI	0	4	0	0	0	6
2018	Theoretical Electrical Engineering	TET	2	2	0	0	0	6
9026	Elective Module	WM				0		6
							Total CP:	30
Summer semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
2023	Efficient Energy Systems	EES	2	1	0	1	0	6
2006	Management Skills	MMK	2	2	0	0	0	6
2019	Measuring Systems	MSS	2	1	0	0	0	6
2022	Smart Grids	SG	2	1	0	1	0	6
9026	Elective Module	WM				0		6
							Total CP:	30
Third semester			L	ST	E	P/S	SSS	CP
Module number	Module title	Module ID						
2033	Colloquium	MKO	0	0	0	0	0	6
2034	Master Thesis	MA	0	0	0	0	0	24
							Total CP:	30

Abbreviations of the teaching forms: L = lecture, ST = tuition in seminars, E = exercise, S = seminar, P = practical, SSS = supervised self-study (all data in semester credit hours);
CP = credit points
W/S = winter/summer semester

Elective Modules Electrical Engineering M.Eng.									
Module number	Module title	Module ID	W/S	L	ST	E	P/S	SSS	CP
2024	Project 1	PRE1	S	0	0	0	1	0	6
2031	Project 2	PRE2	W	0	0	0	1	0	6
2025	Compulsory Elective 1	WPF1	S	0	4	0	0	0	6
2032	Compulsory Elective 2	WPF2	W	0	4	0	0	0	6

Appendix C: Module catalogue

for the study programme Electrical Engineering M.Eng.

Efficient Energy Systems					EES
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
2023	180 h	6	1st or 2nd sem.	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	60	h
	Tuition in seminars	30 students	1	SCH	15	h	30	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	1	SCH	15	h	30	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

The students know the basic relationships between energy-efficient systems and the metrological quantification of energy efficiency. They can apply the relevant procedures, i.e. perform calculations, select materials in a targeted manner and thus improve the energy efficiency of existing systems as well as develop new energy-efficient components and systems. They can evaluate technical systems with regard to their energy efficiency, critically compare them with one another and take a position on the issues of effectiveness, efficiency and sustainability.

3 Contents:

- Energy efficiency in buildings and building services engineering
- Rational use of energy in electrical applications (industry, commerce and private households)
- Energy harvesting
- Methods for determining energy efficiency (including long-term monitoring)

Practicals

Conceptual design and implementation of energy efficiency measurements on selected systems (heat and inductive energy transfer, phase change material, energy harvesting systems).

4 Forms of teaching:

Lecture, seminar-based teaching, practical course

5 Participation requirements:

Formal:	None
Content:	None

6 Forms of assessment:

Oral examination; in each case with preliminary examination

7 Prerequisite for the award of credit points:

Module examination pass with preliminary examination

8 Application of the module (in the following study programmes)

Electrical Engineering M.Eng.

9 Importance of the grade for the final grade:

according to MRPO

10 Module Officer:

Prof. Dr. rer. nat. Sonja Schöning

11 Other information:

Literature will be announced at the beginning of the course. Independent scientific work on the topic

	Designation of the research or development project Long-term research cooperation “mieletec” with the company Miele &Cie. KG, Research project “NanoInduction”
12	Language: German

Electrical Power Management					EPM
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
2026	180 h	6	1st or 2nd sem.	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	60	h
	Tuition in seminars	30 students	1	SCH	15	h	30	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	1	SCH	15	h	30	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

Participants in this course will be able to:

- recognise the enormous advantages of electrical energy over other forms of energy and to implement them in innovative applications.
- use the interaction of electrical energy converters and mechanical systems as well as their intelligent control and networking to optimum advantage in process and product automation.
- learn about unconventional control strategies such as fuzzy control, observer-oriented control, sensorless low-cost automation and redundant safety applications.
- understand the requirements profile of an optimal automation solution also includes operational safety, availability, cost-effectiveness and flexibility, as well as the assessment of dynamics, network feedback, effectiveness of energy use and a forward-looking deployment and inspection system.

3 Contents:

- Modern power electronics and drive systems
- Sensorless and redundant control methods
- Space vector representation and field orientation in three-phase systems
- Methods of fuzzy control and their application in drives
- Intelligent fieldbuses in networked automation systems

Lab practicals:

- Design and construction of a sensorless 4Q drive with the aid of a powerful microcontroller

4 Forms of teaching:

Lecture, seminar-based teaching and laboratory exercises in small groups (3–4 participants)

5 Participation requirements:

Formal:	None
Content:	None

6 Forms of assessment:

Written examination, combination examination or oral examination

7 Prerequisite for the award of credit points:

Module examination pass

8 Application of the module (in the following study programmes)

Electrical Engineering M.Eng.

9 Importance of the grade for the final grade:

according to MRPO

10	Module Officer: Prof. Dr. Ing. habil. Klaus Hofer
11	Other information: Literature will be announced at the beginning of the course. Participants must have sufficient knowledge and experience in handling and the safety of electrical equipment. Laboratory exercises on electrical machines and power electronics of the bachelor's degree study programme in electrical engineering should have been completed.
12	Language: German

Intelligent Energy Systems					IES
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
2029	180 h	6	1st or 2nd sem.	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	60	h
	Tuition in seminars	30 students	1	SCH	15	h	30	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	1	SCH	15	h	30	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

The students recognise the special features of virtual power plants. They distinguish between different smart energy systems in the area of generation, consumption as well as energy management. Students review measures for reliability and safety of energy systems.

3 Contents:

- Virtual power plants
- Intelligent power generation system
- Intelligent and/or energy-efficient energy consumption
- Energy management and energy data management systems
- Control technology for plant and energy engineering
- Reliability and safety of energy systems

Practicals
Design and construction of a smart energy system

4 Forms of teaching:

Lecture, seminar-based teaching, practical course

5 Participation requirements:

Formal:	None
Content:	None

6 Forms of assessment:

Written or oral examination; in each case with preliminary examination performance

7 Prerequisite for the award of credit points:

Module examination pass with preliminary examination

8 Application of the module (in the following study programmes)

Electrical Engineering M.Eng.

9 Importance of the grade for the final grade:

according to MRPO

10 Module Officer:

Prof. Dr.-Ing. Eva Schwenzfeier-Hellkamp

11 Other information:

Literature will be announced at the beginning of the course.

12 Language:

German

Colloquium					MKO
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
2033	180 h	6	3rd sem.	each semester	

1	Course:	Planned group sizes	Scope		Actual contact time/classroom teaching		Self-study	
	Lecture	60 students	0	SCH	0	h	180	h
	Tuition in seminars	30 students	0	SCH	0	h	0	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences:	
	The colloquium complements the master thesis and is to be assessed independently. It serves to determine whether the candidate is capable of orally presenting and independently justifying the scientific topic of the master thesis, its subject-related foundations, its interdisciplinary connections and its non-subject-related references, as well as assessing its significance for practice.	
3	Contents:	
	- Content of the thesis according to the topic - Disputation on the procedure in the preparation of the thesis and the questions that arose in the context of the thesis	
4	Forms of teaching:	
	Oral examination for the master thesis	
5	Participation requirements:	
	Formal:	None
	Content:	Treatment of the master thesis
6	Forms of assessment:	
	Oral examination	
7	Prerequisite for the award of credit points:	
8	Application of the module (in the following study programmes)	
	Electrical Engineering M.Eng., Mechanical Engineering M.Sc. and Optimisation and Simulation M.Sc.	
9	Importance of the grade for the final grade:	
	according to MRPO	
10	Module Officer:	
	Prof. Dr.-Ing. Jens Haubrock	
11	Other information:	
	Literature will be announced at the beginning of the course.	
12	Language:	
	German	

Management Skills					MMK
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
2006	180 h	6	1st or 2nd sem.	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	60	h
	Tuition in seminars	30 students	2	SCH	30	h	60	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences: Students know and understand different management methods and can apply them to specific cases. They understand the connection between corporate goals, leadership culture and social mission. They have learned to analyse entrepreneurial measures from different perspectives. They can evaluate their own behaviour/perception more realistically. They can use methods to motivate employees and themselves, to work successfully in a team and to react sensibly in case of conflict or crisis. They can apply methods to deal sensibly with high task loads.
3	Contents: Strategic corporate planning, motivational theories, leadership methods, values in management, social, professional and methodological competence, general legal issues, occupational safety, environmental protection, energy and resource efficiency, sustainable economic activities, code of German references, intercultural management, global development and production strategies, project management, self-management, target tracking and controlling, balanced score card, technology excellence level, change management, conflict management, stress and time management, communication in the event of a crisis.
4	Forms of teaching: Lectures, case studies, exercises
5	Participation requirements: Formal: None Content: None
6	Forms of assessment: Written examination, combination examination or oral examination
7	Prerequisite for the award of credit points: Module examination pass
8	Application of the module (in the following study programmes) Electrical Engineering M.Eng., Mechanical Engineering M.Sc. and Optimisation and Simulation M.Sc.
9	Importance of the grade for the final grade: according to MRPO
10	Module Officer: Prof. Dr.-Ing. Bruno Hüsgen
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Master Thesis					M.A.
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
2034	720 h	24	3rd sem.	each semester	20 weeks

	Course:	Planned group sizes	Scope		Actual contact time/classroom teaching		Self-study	
1	Lecture	60 students	0	SCH	0	h	720	h
	Tuition in seminars	30 students	0	SCH	0	h	0	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences:	
	With the master thesis, each candidate demonstrates that he/she is able to complete a practice-oriented task from his/her subject area within a specified period of time, both in its subject-specific details and in the interdisciplinary contexts, working independently and according to scientific methods.	
3	Contents:	
	The master thesis is an independent scientific work from the subject area of the respective study programme with a description and explanation of its solution. It can also be determined by an empirical investigation or by conceptual or design tasks or by an evaluation of existing sources. A combination of these forms is possible.	
4	Forms of teaching:	
	Written composition with faculty tutoring	
5	Participation requirements:	
	Formal:	None
	Content:	Coordinated topic from the student's special subject area
6	Forms of assessment:	
7	Prerequisite for the award of credit points:	
8	Application of the module (in the following study programmes)	
	Electrical Engineering M.Eng., Mechanical Engineering M.Sc. and Optimisation and Simulation M.Sc.	
9	Importance of the grade for the final grade:	
	according to MRPO	
10	Module Officer:	
	Prof. Dr.-Ing. Jens Haubrock	
11	Other information:	
	Literature will be announced at the beginning of the course.	
12	Language:	
	German	

Human-Machine Interaction					MMI
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
2030	180 h	6	1st or 2nd sem.	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	0	SCH	0	h	0	h
	Tuition in seminars	30 students	4	SCH	60	h	120	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

Students design, implement and evaluate human-machine interfaces in a methodical way. In doing so, they observe and use the possibilities and limits of the human being and take into account the applicable standards and regulations. They assess which design approaches and which technical ways of implementation can be expected to be effective and efficient. They can develop the components of such human-machine interfaces on the basis of existing hardware and software libraries and turn them into a functional system that has been tested.

3 Contents:

- Continuous theme: Applications related to electrical engineering and in particular power engineering (building automation, smart home, demand-side management, electric vehicles, grid control, control and maintenance, ...)
- Models of human perception and action
- Attention, human error
- Disabilities and accessibility
- Quality characteristics, standards, basic concepts, procedure models
- Methods of requirements analysis, design and prototyping of human-machine interfaces
- Methods for the investigation of human-machine interfaces, statistical evaluation
- Overview of programming techniques: event-based programming, web programming, multi-touch programming
- Sensors and actuators for mobile computing and pervasive computing
- Virtual reality and augmented reality
- Information visualisation
- Persuasive computing, gamification
- Basic concepts and applications of machine learning for “intelligent” human-machine interfaces

The development of solutions for partial aspects of problems from practice, integration and testing in experiments is integrated into the seminar. Development platform: current PC peripherals and/or smartphone/tablet technology.

4 Forms of teaching:

Seminar-based teaching

5 Participation requirements:

	Formal:	None
	Content:	None
6	Forms of assessment: Written examination or oral examination	
7	Prerequisite for the award of credit points: Module examination pass	
8	Application of the module (in the following study programmes) Electrical Engineering M.Eng.	
9	Importance of the grade for the final grade: according to MRPO	
10	Module Officer: Prof. Dr. rer. nat. Jörn Loviscach	
11	Other information: Literature will be announced at the beginning of the course.	
12	Language: German	

Measuring Systems					MSS
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
2019	180 h	6	1st or 2nd sem.	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	60	h
	Tuition in seminars	30 students	1	SCH	15	h	75	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

- Signal analysis capability
- Applied signal processing, especially correlation methods
- Development competence of virtual measuring and sensor systems
- Problem solving skills in a team

3 Contents:

- Fundamentals of signal theory
- Digital signal processing
- Correlation measurement technology
- Automation of measuring and sensor systems
- Implementation of the systems on microprocessors
- Scientific work

4 Forms of teaching:

Lecture, seminar teaching
Scientific project in small groups (2 to 3)

5 Participation requirements:

Formal:	None
Content:	None

6 Forms of assessment:

Written examination or oral examination

7 Prerequisite for the award of credit points:

Module examination pass

8 Application of the module (in the following study programmes)

Electrical Engineering M.Eng.

9 Importance of the grade for the final grade:

according to MRPO

10 Module Officer:

Prof. Dr.-Ing. Thomas Westerwalbesloh

11 Other information:

Literature will be announced at the beginning of the course.
Participants should have their own licence for LabVIEW for self-study

12 Language:

German

Microcontrollers and Applications					MIC
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
2021	180 h	6	1st or 2nd sem.	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	60	h
	Tuition in seminars	30 students	1	SCH	15	h	30	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	1	SCH	15	h	30	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences: Students enhance their knowledge and skills in the use of microcontrollers. They programme different controllers. They implement digital processing of measurement data on a controller and also apply external measurement technology safely. Using typical application examples, students identify the characteristics of different analogue and digital interfaces and evaluate them.
3	Contents: MC architecture MC programming Analogue and digital interfaces Digital processing and dissemination of measurement data Practicals: Design and build microcontroller applications with analogue and digital periphery
4	Forms of teaching: Lecture, seminar-based teaching, practical course
5	Participation requirements: Formal: None Content: None
6	Forms of assessment: Written or oral examination; in each case with preliminary examination performance
7	Prerequisite for the award of credit points: Module examination pass with preliminary examination
8	Application of the module (in the following study programmes) Electrical Engineering M.Eng.
9	Importance of the grade for the final grade: according to MRPO
10	Module Officer: Prof. Dr.-Ing. Thomas Hesse
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Nonlinear Control Systems					NLR
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
2020	180 h	6	1st or 2nd sem.	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	60	h
	Tuition in seminars	30 students	1	SCH	15	h	30	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	1	SCH	15	h	30	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences:	
	The students master procedures for both the analysis and synthesis of control systems and controls of nonlinear, concentrated parametric systems	
3	Contents:	
	Analysis: - Lyapunov stability theory - Controllability and observability Synthesis of nonlinear control systems: - Exact input/output linearisation - Exact state linearisation - Differential flatness	
4	Forms of teaching:	
	Lecture, seminar-based teaching, practical course	
5	Participation requirements:	
	Formal:	None
	Content:	None
6	Forms of assessment:	
	Written examination or oral examination	
7	Prerequisite for the award of credit points:	
	Module examination pass	
8	Application of the module (in the following study programmes)	
	BioMechatronics M.Sc. and Electrical Engineering M.Eng.	
9	Importance of the grade for the final grade:	
	according to MRPO	
10	Module Officer:	
	Prof. Dr.-Ing. Dirk Weidemann	
11	Other information:	
	Literature will be announced at the beginning of the course.	
12	Language:	
	German	

Project 1					PRE1
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
2024	180 h	6	1st or 2nd sem.	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	0	SCH	0	h	0	h
	Tuition in seminars	30 students	0	SCH	0	h	0	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	1	SCH	15	h	165	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences: - Scientific work - Ability to work in a team - Communication skills - Motivation - Interconnected thinking and acting
3	Contents: Independent solving of research and development tasks in the respective chosen specialisation. - Project management - Communication - Knowledge management - Literature review - Engineering work - Presentation
4	Forms of teaching: Small group project 1–3 participants
5	Participation requirements: Formal: None Content: None
6	Forms of assessment: Combination exam
7	Prerequisite for the award of credit points: Module examination pass
8	Application of the module (in the following study programmes) Electrical Engineering M.Eng.
9	Importance of the grade for the final grade: according to MRPO
10	Module Officer: Prof. Dr.-Ing. Dirk Zielke
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Project 2					PRE2
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
2031	180 h	6	1st or 2nd sem.	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	0	SCH	0	h	0	h
	Tuition in seminars	30 students	0	SCH	0	h	0	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	1	SCH	15	h	165	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

- Scientific work
- Ability to work in a team
- Communication skills
- Motivation
- Interconnected thinking and acting

3 Contents:

Independent solving of research and development tasks in the respective chosen specialisation.

- Project management
- Communication
- Knowledge management
- Literature review
- Engineering work
- Presentation

4 Forms of teaching:

Small group project 1–3 participants

5 Participation requirements:

Formal:	None
Content:	None

6 Forms of assessment:

Project work

7 Prerequisite for the award of credit points:

Module examination pass

8 Application of the module (in the following study programmes)

Electrical Engineering M.Eng.

9 Importance of the grade for the final grade:

according to MRPO

10 Module Officer:

Prof. Dr.-Ing. Dirk Zielke

11 Other information:

Literature will be announced at the beginning of the course.

12 Language:

German

Sensor Systems					SSY
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
2027	180 h	6	1st or 2nd sem.	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	60	h
	Tuition in seminars	30 students	1	SCH	15	h	30	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	1	SCH	15	h	30	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences:	
	Deepening and expanding knowledge and skills in the use of sensors as an interface between electronic systems and the outside world. In the process, the control and evaluation of sensor signals as well as the coupling with microcontrollers analysed.	
3	Contents:	
	1. Analogue and digital sensors - Acceleration sensors - Rotation rate sensors - Pressure sensors - Magnetic field sensors 2. Digital processing of sensor signals 3. Sensor interfaces and microcontroller couplings Practicals: Design and construction of a sensor application using a microcontroller board.	
4	Forms of teaching:	
	Lecture, seminar-based teaching, practical course	
5	Participation requirements:	
	Formal:	None
	Content:	None
6	Forms of assessment:	
	Written examination, combination examination or oral examination; each with preliminary examination performance	
7	Prerequisite for the award of credit points:	
	Module examination pass with preliminary examination	
8	Application of the module (in the following study programmes)	
	Electrical Engineering M.Eng.	
9	Importance of the grade for the final grade:	
	according to MRPO	
10	Module Officer:	
	Prof. Dr.-Ing. Dirk Zielke	
11	Other information:	
	Literature will be announced at the beginning of the course.	
12	Language:	
	German	

Smart Grids					SG
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
2022	180 h	6	1st or 2nd sem.	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	55	h
	Tuition in seminars	30 students	1	SCH	15	h	22.5	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	1	SCH	15	h	22.5	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences:	
	Independent development of models and their application for the analysis and evaluation of energy systems. Integration and development of solution strategies, implementation and verification using a simulation with a focus on: - Assessment of system security and network security - Planning and verification of the system integration of decentralised energy systems such as smart storage, smart generation and smart consumers. Evaluation of energy supply systems	
3	Contents:	
	Intelligent electrical energy systems (smart grids), system control and system services. Energy management systems. System monitoring and identification of critical situations. Improvement of the transmission properties of electrical power transmission. Use of FACTS.	
4	Forms of teaching:	
	Lectures, seminar-based teaching and practicals	
5	Participation requirements:	
	Formal:	None
	Content:	Module 1060, Electrical Networks from BA degree programme RGE or equivalent Modules: 1060 Electrical Networks;
6	Forms of assessment:	
	Term paper or exam accompanying the course	
7	Prerequisite for the award of credit points:	
	Module examination pass and course assessment	
8	Application of the module (in the following study programmes)	
	Electrical Engineering M.Eng.	
9	Importance of the grade for the final grade:	
	according to MRPO	
10	Module Officer:	
	Prof. Dr.-Ing. Jens Haubrock	
11	Other information:	
	Smart Grids by Buchholz/Styczynski	
12	Language:	
	German	

Theoretical Electrical Engineering					TET
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
2018	180 h	6	1st or 2nd sem.	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	60	h
	Tuition in seminars	30 students	2	SCH	30	h	60	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

Students have a sound basic understanding of the physics of electric, magnetic and electromagnetic fields. They know the meaning of Maxwell's equations and can apply them to solve practical problems. In this module, students will also learn about a range of current approaches to catch up with the state of the art in research in this field. The critical examination of theoretical approaches is a key element of the discussions and deepened through practical implementation.

3 Contents:

- Mathematical basics and tools
- Maxwell's equations: Formulation in integral and differential form
- Magneto- and electrostatics, slow-varying electric and magnetic fields and fast-varying electromagnetic fields, electromagnetic waves, eddy currents, induction, nano- and micromagnetism
- Theoretical description of semiconductor devices (pn-, Schottky junction, field effect transistors, ...)
- Computational methods in theoretical electrical engineering
- Theory and practice of numerical simulation methods (Finite Difference Method (FDM), Finite Element Method (FEM) etc.)
- Possibilities and limits of numerical methods
- Application examples

4 Forms of teaching:

Lecture, exercise, practical course

5 Participation requirements:

Formal:	None
Content:	None

6 Forms of assessment:

Term paper, written examination or combination exam

7 Prerequisite for the award of credit points:

Module examination pass

8 Application of the module (in the following study programmes)

Electrical Engineering M.Eng.

9 Importance of the grade for the final grade:

according to MRPO

10 Module Officer:

Prof. Dr. rer. nat. Christian Schröder

11 Other information:

	Literature will be announced at the beginning of the course.
12	Language: German

Elective Module					WM
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
9026	180 h	6	1st or 2nd sem.	each semester	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students		SCH		h		h
	Tuition in seminars	30 students		SCH		h		h
	Exercise	20 students		SCH		h		h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students		SCH		h		h
2	Learning outcomes/competences:							
3	Contents:							
4	Forms of teaching:							
5	Participation requirements:							
	Formal:							
	Content:							
6	Forms of assessment:							
7	Prerequisite for the award of credit points:							
8	Application of the module (in the following study programmes) Electrical Engineering M.Eng.							
9	Importance of the grade for the final grade:							
10	Module Officer: Prof. Dr.-Ing. Dirk Zielke							
11	Other information:							
12	Language: German							

Compulsory Elective 1					WPF1
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
2025	180 h	6	1st or 2nd sem.	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	0	SCH	0	h	0	h
	Tuition in seminars	30 students	4	SCH	60	h	120	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences:	
3	Contents:	
4	Forms of teaching:	
5	Participation requirements:	
	Formal:	None
	Content:	Students can attend any module from the programme syllabus of the consecutive master's degree study programmes at Bielefeld University of Applied Sciences by prior arrangement with the programme directors. The selected module must not be a compulsory module of the respective specialisation taken.
6	Forms of assessment:	
7	Prerequisite for the award of credit points:	Module examination pass
8	Application of the module (in the following study programmes)	Electrical Engineering M.Eng.
9	Importance of the grade for the final grade:	according to MRPO
10	Module Officer:	Prof. Dr.-Ing. Dirk Zielke
11	Other information:	Literature will be announced at the beginning of the course.
12	Language:	German

Compulsory Elective 2					WPF2
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
2032	180 h	6	1st or 2nd sem.	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	0	SCH	0	h	0	h
	Tuition in seminars	30 students	4	SCH	60	h	120	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	0	SCH	0	h	0	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2	Learning outcomes/competences:	
3	Contents:	
4	Forms of teaching:	
5	Participation requirements:	
	Formal:	None
	Content:	Students can attend any module from the programme syllabus of the consecutive master's degree study programmes at Bielefeld University of Applied Sciences by prior arrangement with the programme directors. The selected module must not be a compulsory module of the respective specialisation taken.
6	Forms of assessment:	
7	Prerequisite for the award of credit points: Module examination pass	
8	Application of the module (in the following study programmes) Electrical Engineering M.Eng.	
9	Importance of the grade for the final grade: according to MRPO	
10	Module Officer: Prof. Dr.-Ing. Dirk Zielke	
11	Other information: Literature will be announced at the beginning of the course.	
12	Language: German	

Wide Area Networks and IT Security					WIS
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
2028	180 h	6	1st or 2nd sem.	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	SCH	30	h	60	h
	Tuition in seminars	30 students	1	SCH	15	h	30	h
	Exercise	20 students	0	SCH	0	h	0	h
	Practical or seminar	15 students	1	SCH	15	h	30	h
	Supervised self-study	60 students	0	SCH	0	h	0	h

2 Learning outcomes/competences:

- Students describe and evaluate the methods of IP addressing in local and wide area networks.
- Students compare the functions and tasks of wide area networks with those of local networks. They plan secure local networks, identify vulnerabilities and take countermeasures to protect a network.
- The students compare and weight different procedures in the field of IT security and assign them to the layers of the OSI reference model.
- Students describe different authentication and encryption methods, can classify them and calculate components of encryption.
- The students work independently on a current topic in the field of IT security, prepare a paper, present the result in the seminar and discuss the topics with their fellow students.

3 Contents:

- Structure and function of local and wide area networks,
- Protocols and IP addressing concepts (IPv4/IPv6),
- Attacks on network security,
- Risk analysis and building a secure infrastructure,
- Security with AAA and firewalls,
- Cryptography and virtual private networks (VPN)
- Step-by-step configuration of a protected network environment.

4 Forms of teaching:

Lecture, seminar-based teaching, practical course

5 Participation requirements:

Formal:	None
Content:	None

6 Forms of assessment:

Written examination, combination examination or oral examination

7 Prerequisite for the award of credit points:

Module examination pass and course assessment

8 Application of the module (in the following study programmes)

Electrical Engineering M.Eng.

9 Importance of the grade for the final grade:

according to MRPO

10 Module Officer:

Prof. Dr.-Ing. Lutz Grünwoldt

11	Other information: Literature will be announced at the beginning of the course. A script will be provided. Each student becomes a member of a Cisco class and has access to a simulation environment and extensive online curricula. Certificates can be issued for successful participation in Cisco final exams.
12	Language: German