Appendix C: Module catalogue

for the study programme Renewable Energies B.Eng.

Industrial Plant Layout 21
Power Drive Technology 22
Automation Technology 24
Bachelor Thesis 25
Business Administration 26
Biochemistry and Microbiology* 28
Biogas and Biorefineries* 29
Chemistry* 30
Decentralised Energy Systems 31
Efficient Illumination Technology 32
Electrical Energy Storage and Fuel Cells 34
Electrical Machines 35
Power Systems 37
Electronics 38
Electrical Engineering 1 39
Electrical Engineering 2 40
Electric Traction 42
Energy Efficiency in the Building 44
Building Automation 46
Gender and Diversity: Success Factors for Companies 48
Fundamentals of Electrical Energy Technology 50
Computer Science 1 51
Computer Science 2 53
Investment and Financing 55
Colloquium 57
Power Electronics 58
Mathematics 1 60
Mathematics 2 62
Metrology 64

Modern Energy Policy 65
Personnel and Organisation 66
Photovoltaics 68
Physics 1 69
Physics 2 71
Practical Project / Internship 73
Product and Price Management 74
Product Risk Management 75
Project 1 77
Project 2 78
Automatic Control Engineering 79
Renewable Energy Industry 80
Sensors 82
Technical English 1 84
Technical English 2 86
Textile Technologies 88
Thermal Use of Renewable Energies 89
Thermodynamics 1 91
Process Engineering* 93
Elective Module 94
Hydrogen as a Source of Energy 95
Wind and Hydropower 97
Circular Economy According to Cradle to Cradle 99
State Space Control 101

*Translations of these module descriptions are currently not available.

Industrial Plant Layout					APL
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1010	150 h	5	4th or 6th sem.	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	1	weekly hours	15	h	22	h
	Exercise	20 students	1	weekly hours	15	h	23	h
	Practical or seminar	15 students	0	weekly hours	0	h	0	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2	Learning outcomes/competences: After successful completion of the module Industrial Plant Layout, the students are able to systematically evaluate a planning task in low voltage and medium/high voltage and to critically question the solution. This includes the structuring of the planning task and the analysis of the task. The students can defend the solutions.
3	Contents: Systematic approach to plant planning and design. Design, dimensioning and assessment of energy production plants using the example of biogas plants. Planning and projecting of electrical energy systems and electrical energy generation systems, especially regenerative energy generation systems. Current aspects of new construction and the expansion planning of electrical power supply systems.
4	Forms of teaching: Lecture and seminar
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 and course assessment
8	Application of the module (in the following study programmes) Electrical Engineering B.Eng., Renewable Energies B.Eng. and Industrial Engineering and Management B.Sc.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Jan Boris Loesenbeck
11	Other information: Literature will be announced at the beginning of the course. Renewable Energies study programme, specialisation in Energy Efficient Systems: Elective subject
12	Language: German

Power Drive Technology					ATR
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1013	150 h	5	4th or 6th semester	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	1	weekly hours	15	h	22.5	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	1	weekly hours	15	h	22.5	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

- With regard to the contents listed below, students are familiar with the dynamic models of electrical machines. Based on this, they can analyse, design and evaluate suitable control structures for variable-speed drives. They are able to dimension the controllers in the frequency range and evaluate the resulting behaviour. Students will be able to identify basic boundary conditions for the use of variable-speed drives and to select suitable drives.

3 Contents:

Dynamic models

- Model and action diagram of the DC machine
- Space vector representation of the synchronous machine in stator- and rotor-fixed coordinates
- Space vector representation of the asynchronous machine in stator- and rotor-flux coordinates
- Information on drive design and dimensioning

Control technology for drives

- Transmission function and frequency response, Nyquist stability criterion
- Overshoot ranges, rise times, phase reserve and penetration frequency
- Frequency characteristic method, optimum amount and symmetry
- Realization of time-discrete drive controls with microcontrollers
- Cascade control for DC and induction machines

4 Forms of teaching:

Lecture, sem. lessons lessons with exercises, practical course

5 Participation requirements:

Formal:	None
Content:	Modules: Electrical Machines (1059);

6 Forms of assessment:

Written 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 B.Eng. and Renewable Energies B.Eng.

Importance of the grade for the final grade:

9	according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Andreas Bünte
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Automation Technology					AT
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1315	150 h	5	3rd sem.	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	1	weekly hours	15	h	22.5	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	1	weekly hours	15	h	22.5	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

Students learn the fundamental difference between closed loop and open loop control for systems with either discrete or continuous signals. Based on the fundamentals of systems theory, skills for the design and implementation of discrete-event controls as well as basic knowledge of the observation and diagnosis of discrete-event systems are taught.

3 Contents:

- Basic concepts of automation technology and systems theory
- Description of discrete-event systems by deterministic and non-deterministic autonomous automata, standard automata, input/output automata and Petri nets.
- Behaviour of deterministic and non-deterministic autonomous automata, standard automata, input/output automata and Petri nets.
- Heuristic control design and implementation of the control law by means of application list (AWL) and step chains.
- Systematic design of discrete-event controllers based on a model of the control path
- Observation and diagnosis of discrete-event systems

4 Forms of teaching:

Lecture with accompanying seminar exercises and practicals

5 Participation requirements:

Formal:	None
Content:	None

6 Forms of assessment:

Written examination; each 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 B.Eng. and Renewable Energies B.Eng.

9 Importance of the grade for the final grade:

according to BRPO

10 Module coordinator:

Prof. Dr.-Ing. Dirk Weidemann

11 Other information:

Literature will be announced at the beginning of the course.

12 Language:

German

Bachelor Thesis					BA
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1291	360 h	12	6thor 7th sem.	each semester	12 weeks

	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
1	Lecture	60 students	0	weekly hours	0	h	360	h
	Sem. lessons	30 students	0	weekly hours	0	h	0	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	0	weekly hours	0	h	0	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2	Learning outcomes/competences:	
	With the bachelor 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 bachelor thesis is usually an independent investigation with an engineering science or engineering technology task. It should deal with the subject matter in detailed descriptions and explanations and be prepared as a written paper.	
4	Forms of teaching:	
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)	
	Biotechnology and Instrumentation Engineering B.Sc., Electrical Engineering B.Eng., Engineering Computer Sciences B.Eng, Mechanical Engineering B.Eng., Mechatronics B.Sc., Renewable Energies B.Eng. and Industrial Engineering and Management B.Sc.	
9	Importance of the grade for the final grade:	
	according to BRPO	
10	Module coordinator:	
	N.N.	
11	Other information:	
	Literature will be announced at the beginning of the course.	
12	Language:	
	German	

Business Administration					BW
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1024	150 h	5	3rd or 5th sem.	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	3	weekly hours	45	h	67.5	h
	Sem. lessons	30 students	1	weekly hours	15	h	22.5	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	0	weekly hours	0	h	0	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

The students know the basic organisational and legal structures of companies and are familiar with the optimisation tasks in selected entrepreneurial functional areas as well as with the basic principles and success criteria of economic action in order to be able to classify their engineering activities in a business management context and to evaluate the economic consequences of their activities. The students master methods and tools for problem solving in selected corporate functional areas. They can apply business management instruments and calculation methods in a target-oriented manner and assess their effects.

3 Contents:

- Basic concepts of business administration / basic principles of economic action
- Overview of the entrepreneurial functional areas of the goods economy, financial economy and information economy level
- Corporate goals and corporate key figures / key figure systems
- Basic concepts of private and commercial law
- Forms of corporate law

4 Forms of teaching:

Lecture, sem. lessons with case studies / case studies / exercises

5 Participation requirements:

Formal:	
Content:	

6 Forms of assessment:

Written examination, combination examination, performance 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 B.Eng, Engineering Computer Sciences B.Eng., Mechanical Engineering B.Eng. and Renewable Energies B.Eng.

9 Importance of the grade for the final grade:

according to BRPO

10 Module coordinator:

Prof. Dr. rer. oec. Klaus Rüdiger

11 Other information:

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

Decentralised Energy Systems					DEC
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1042	150 h	5	5th sem.	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	1	weekly hours	15	h	22.5	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	1	weekly hours	15	h	22.5	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2	Learning outcomes/competences: Students understand the technical structure and economic function of energy supply systems. They are familiar with combined heat and power (CHP) technology plants and can calculate, evaluate and analyse the processes. They are familiar with the basic interrelationships for modelling decentralised energy systems and can assess the reliability of energy supply systems.
3	Contents: Structure and function of the German energy market (power exchange). Design and structure of centralised / decentralised energy supply systems. Working machines for combined heat and power generation. Reliability and availability of electrical energy supply systems
4	Forms of teaching: Lecture, sem. lessons with exercises and 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 B.Eng. and Renewable Energies B.Eng.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Jens Haubrock
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Efficient Illumination Technology					ELT
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1050	150 h	5	6th sem.	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	1	weekly hours	15	h	22.5	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	1	weekly hours	15	h	22.5	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

Students understand the basic structure of lighting systems and their components. They plan lighting systems, e.g. with simulation software, and compare the results with real practical examples or those of the demonstration situated in the lighting technology laboratory at Bielefeld University of Applied Sciences. The students can classify the results in the state of research and development.

3 Contents:

- Light and basic photometric quantities
- Photometric measurements
- Light sources:
  Properties and characteristic values of lamps and luminaires
- Luminaires:
  Elements of light control
  Luminaire requirements and principles (e.g. indoor and outdoor luminaires)
- Lighting design using simulation programs
- Measurement technology:
  Photometric and radiometric parameters (light measurement system integration sphere)
- Intelligent light control
- Energy considerations according to applicable standards

4 Forms of teaching:

Lecture, sem. lessons with exercises and 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 and course assessment

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

Renewable Energies B.Eng.

9 Importance of the grade for the final grade:

according to BRPO

10 Module coordinator:

Prof. Dr.-Ing. Eva Schwenzfeier-Hellkamp

11 Other information:

Literature will be announced at the beginning of the course.

12	Language: German

Electrical Energy Storage and Fuel Cells					EEB
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1056	150 h	5	5th sem.	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	1	weekly hours	15	h	22.5	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	1	weekly hours	15	h	22.5	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2	Learning outcomes/competences: The students are familiar with different energy storage technologies. They can classify them and understand the difference between power storage and energy storage. They know the technical basics of storage and retrieval and the structure of storage systems. Students in this module are able to design and optimally dimension a possible energy storage system for a specific task. They are familiar with the fundamentals of simulation and modelling of energy storage systems.
3	Contents: Physical basics of selected storage technologies (e.g. accumulators, double-layer capacitors, flywheel mass, pumped storage, superconducting magnetic energy storage). Classification of storage according to power and energy storage. Application examples of storage systems, optimal design and dimensioning of storage systems. Fuel cell systems, structure and classification of selected technologies.
4	Forms of teaching: Lecture, sem. lessons with exercises and 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 and course assessment
8	Application of the module (in the following study programmes) Electrical Engineering B.Eng. and Renewable Energies B.Eng.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Jens Haubrock
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Electrical Machines					EM
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1059	150 h	5	3rd or 5th sem.	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	1	weekly hours	15	h	22.5	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	1	weekly hours	15	h	22.5	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

Based on the contents listed below, students will be familiar with the structure, operating behaviour and areas of application of static and moving electrical machines. They will be able to analyse, design and evaluate the operating behaviour with equivalent circuit diagrams and pointer diagrams. Students will be able to identify basic boundary conditions for the use of electrical machines, as well as to design and evaluate them.

3 Contents:

Fundamentals: materials, insulation classes, operating modes and energy efficiency classes, multi-phase systems

Transformers (single-phase and three-phase)

- Design, mode of operation, models and equivalent circuit diagrams
- Open-circuit and short-circuit tests, parameter determination, parallel circuit of transformers

DC machines

- Design, mode of operation, models and equivalent circuit diagrams
- Operating behaviour, including field weakening

Induction machines (synchronous and asynchronous machines)

- Stator winding, lining and induction shaft, torque and voltage formation
- Equivalent circuit diagrams, pointer diagrams and current locus curves
- Applications, speed setting and operating limits

4 Forms of teaching:

Lecture, sem. lessons with exercises, practical course

5 Participation requirements:

Formal:	None
Content:	Modules: 1071 Electrical Engineering I; 1074 Electrical Engineering I; 1075 Electrical Engineering II; 1077 Electrical Engineering II

6 Forms of assessment:

Written 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 B.Eng. and Renewable Energies B.Eng.

Importance of the grade for the final grade:

9	according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Andreas Bünte
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Power Systems					ENE
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1060	150 h	5	6th sem.	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	1	weekly hours	15	h	22.5	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	1	weekly hours	15	h	22.5	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2	Learning outcomes/competences: Graduates of the module are able to analyse and optimise complex, meshed energy supply systems. Question and assess the grid structure with regard to n-1 criterion, V/Q control and P/f control. They can describe the structure of a control system and are able to design and calculate a grid protection concept for complex energy supply systems.
3	Contents: Normalisation to related network data (per unit values), calculation of energy transmission systems and networks, Mains protection and control technology. Operation of electrical supply networks, mains frequency regulation, symmetrical short-circuit currents, symmetrical components, handling of asymmetries, neutral point treatment.
4	Forms of teaching: Lecture, sem. lessons with exercises and practical course
5	Participation requirements: Formal: None Content: Fundamentals of Energy Technology (1097)
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) Renewable Energies B.Eng.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Jens Haubrock
11	Other information: Literature will be announced at the beginning of the course. Study programme Renewable Energies, specialisation Energy Generation Systems: Elective subject
12	Language: German

Electronics					ELR
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1064	150 h	5	2nd sem.	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	1	weekly hours	15	h	22.5	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	1	weekly hours	15	h	22.5	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

The students know the elementary interrelationships of electronics, in particular the most important components and basic circuits used in electronics. They have mastered the most common methods and tools to independently design and analyse electronic systems.

3 Contents:

- Conduction mechanism: metallic conduction, pure and doped semiconductors
- Fundamentals of semiconductor physics
- Diodes:
  Parameters, diode types, models, characteristics and data sheets
  Rectifier circuits
  Voltage multiplier
- Transistors:
  Design, operating principle, types, characteristic curves and data sheets
  Voltage stabilisation and constant current source with transistor
  Operating point stabilisation and AC voltage amplifier
  Transistors as switches

4 Forms of teaching:

Lecture, sem. lessons with exercises and 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 and course assessment

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

Renewable Energies B.Eng.

9 Importance of the grade for the final grade:

according to BRPO

10 Module coordinator:

Prof. Dr.-Ing. Eva Schwenzfeier-Hellkamp

11 Other information:

Literature will be announced at the beginning of the course.

12 Language:

German

Electrical Engineering 1					ET1
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1074	150 h	5	1st sem.	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	1	weekly hours	15	h	22.5	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	1	weekly hours	15	h	22.5	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

Graduates are able to calculate electrical DC circuits with the usual calculation methods (see content). They know the methods of network analysis and can solve them independently on a complex task. They can calculate the electric flow field and solve tasks. They are familiar with electric and magnetic fields and can independently derive and apply solutions to tasks set for them.

3 Contents:

Lecture and seminar:
Basic physical terms in electrical engineering, two- and four-terminal circuits, calculation of electrical circuits, equivalent circuits, calculation of DC electrical networks, electrostatic field, electric current field, stationary magnetic field.
Practicals:
- Voltage source
- Temperature-dependent resistance
- Magnetic circuit

4 Forms of teaching:

Lecture, sem. lessons with exercises and 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)

Renewable Energies B.Eng.

9 Importance of the grade for the final grade:

according to BRPO

10 Module coordinator:

Prof. Dr.-Ing. Jens Haubrock

11 Other information:

Grundlagen der Elektrotechnik by Gerd Hagemann or Elektrotechnik für Bachelorstudenten by Wolfgang Nerreter

12 Language:

German

Electrical Engineering 2					ET2
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1077	150 h	5	2nd sem.	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	1	weekly hours	15	h	22.5	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	1	weekly hours	15	h	22.5	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

Graduates are able to calculate, evaluate and assess electrical alternating current circuits by means of complex calculations, also graphically. They can independently formulate, solve and comparatively evaluate tasks for linear alternating current and three-phase current systems. They can design the transfer function of electrical circuits and solve and analyse tasks from this segment.

3 Contents:

Lecture and seminar:
- Time-varying electromagnetic field
- Alternating voltage and alternating current
- Complex alternating current calculation
- Energy and power with alternating current
- Symmetrical three-phase systems
- Power and energy with symmetrical load

Practicals:
- Modelling of real passive components
- Characteristics of AC circuits
- Balanced/unbalanced three-phase network

4 Forms of teaching:

Lecture, sem. lessons with exercises and practical course

5 Participation requirements:

Formal:	None
Content:	Module Electrical Engineering 1 (1074)

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)

Renewable Energies B.Eng.

9 Importance of the grade for the final grade:

according to BRPO

10 Module coordinator:

Prof. Dr.-Ing. Jens Haubrock

Other information:

11	Grundlagen der Elektrotechnik by Gerd Hagemann or Elektrotechnik für Bachelorstudenten by Wolfgang Nerreter
12	Language: German

Electric Traction					ETR
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1078	150 h	5	4th or 6th sem.	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	1	weekly hours	15	h	22.5	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	1	weekly hours	15	h	22.5	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

Students will be enabled to:

- learn and understand the design of electric vehicles with rotary and linear drive systems
- realistically assess the problems of storing electrical energy
- adopt the enormous advantages and future prospects of electric road vehicles and apply them in a useful way

3 Contents:

- Traction characteristics (road grip) of electric road and rail vehicles (multi-motor drives) in comparison to vehicles with combustion drive systems
- Ecological consumption formula for the energy demand of different means of transport in SI units and the definition of environmentally friendly mobility
- Energy storage on mobile vehicles (electrochemical and mechanical storage)
- Alternative solutions with hybrid drives, fuel cells, ultracaps and regenerative energy sources (solar vehicles)
- Useful tips for energy-saving driving style
- Practical applications (ICE, Transrapid, e-car, e-bike, e-unicycle)

4 Forms of teaching:

Lecture, sem. lessons and laboratory exercises in small groups (3–4 participants)

5 Participation requirements:

Formal:	None
Content:	Modules on Electrical Machines (1059) and Power Electrics (1138) should have been successfully completed

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 B.Eng. and Renewable Energies B.Eng.

9 Importance of the grade for the final grade:

according to BRPO

10 Module coordinator:

Prof. Dr.-Ing. Herbert Funke

11	Other information: Literature will be announced at the beginning of the course. Students must have sufficient knowledge and experience in the use and safety of electrical equipment
12	Language: German

Energy Efficiency in the Building					EIG
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1323	150 h	5	6th sem.	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	2	weekly hours	30	h	45	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	0	weekly hours	0	h	0	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

Students understand basic building physics processes and can apply them to the planning and evaluation of simple building structures. They know the methods for the energetic balancing of buildings according to legal regulations and can implement these using software on concrete examples. By means of practical exercises, they learn to use unknown standards for the processing engineering tasks. Furthermore, the students have knowledge of various certifications for buildings with increased energy or ecological requirements and can evaluate them with regard to the criteria of sustainability, feasibility and economic efficiency. Students understand the basic idea of model-based planning along the lines of Building Information Modelling (BIM) and can classify the influence on work processes in the construction industry.

3 Contents:

Determination of heat losses via the building envelope

- Calculation of the U-value
- Thermal bridges

Avoidance of damage to building elements (DIN 4108-2, Glaser method)

- Condensation inside building elements and on surfaces
- Mould criterion

Law for saving energy and using renewable energy for heating and cooling in buildings (Building Energy Law – GEG)

- Calculation / requirements according to GEG/ DIN V 18599
- Energy demand
- Building supply HVAC (heating/cooling/air conditioning) according to DIN V 18599
- Software introduction

Use of renewable energies according to GEG

Summer thermal insulation (DIN 4108-2)

Increased requirements for the quality of buildings

- KfW, DGNB, BREEAM, LEED, municipal requirements/ energy

	guidelines • C2C inspired buildings Alternative materials • Basics BIM (digitalisation, professional fields, innovations)
4	Forms of teaching: Lecture, sem. lessons
5	Participation requirements: Formal: | Content: |
6	Forms of assessment: Term paper, 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) Renewable Energies B.Eng.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Eva Schwenzfeier-Hellkamp
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Building Automation					GAT
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1095	150 h	5	4th or 6th semester	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	2	weekly hours	30	h	45	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	0	weekly hours	0	h	0	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

The students determine the requirements for building automation for residential and non-residential buildings, in particular for the integration of local renewable energy generation, with the help of the specifications from the relevant standards and guidelines and with the help of basic physical models of the components for heating, ventilation and air conditioning. They design basic automations and controls using standard techniques and standard diagrams. They discuss the contributions of such plants to energy efficiency qualitatively and quantitatively. They methodically assess which human-building interfaces are appropriate for the respective application.

3 Contents:

- Definition and structure of building automation
- Possibilities and limits of energy efficiency through smart buildings
- Requirements for human use: comfort, pollutants, etc.
- Heating, ventilation, air conditioning: basic devices (also for the use of renewable energies), physical principles, characteristic curves
- Use of sensors and actuators; ubiquitous/pervasive computing
- Control, controller types, optimisation of energy use
- Bus systems, protocols, networking, computer systems, building management systems
- User interfaces, usability
- Accessibility, ambient assisted living, smart homes
- Overarching topics: Standards, guidelines, standard diagrams for planning and documentation

4 Forms of teaching:

Lecture, seminar

5 Participation requirements:

Formal:	None
Content:	Computer Science 1 (1107), Control Engineering (1235), Fundamentals of Electrical Energy Technology (1097), Sensor Technology (1243)

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)

	Engineering Computer Sciences B.Eng and Renewable Energies B.Eng.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr. rer. nat. Jörn Loviscach
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Gender and Diversity: Success Factors for Companies					GUD
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
3135	150 h	5	5th sem.	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	2	weekly hours	30	h	45	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	0	weekly hours	0	h	0	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

The students ..

- know the terms, history and differences of gender/gender mainstreaming and diversity/diversity management.
- know legal principles in the context of gender and diversity (e.g. EU Anti-Discrimination Directive, General Equal Treatment Act)
- are sensitised to human heterogeneity in the corporate context.
- independently recognise stereotyping and can develop ideas for possible changes in the business environment.
- are able to independently collect relevant information on established concepts such as gender mainstreaming and diversity management and to assess their relevance for professional practice.
- are familiar with selected theories and approaches in the current discourse on diversity management and, building on this, are able to develop conceptual ideas for the implementation of holistic diversity management in a corporate context.

3 Contents:

- Definitions and delimitation of gender and diversity
- Concepts and approaches to equal opportunities (e.g. diversity management, gender mainstreaming)
- Legal basis and political influences (e.g. EU Anti-Discrimination Directive, General Anti-Discrimination Directive, General Equal Treatment Act (German abbreviation: AGG))
- Subjective and social values, attitudes and prejudices in the context of diversity
- Possible approaches for taking diversity characteristics (e.g. gender and age) into account in selected areas of business (marketing, product development, human resources)
- Concept for the sustainable introduction of holistic diversity management
- Case studies and application examples from business practice

4 Forms of teaching:

Lecture, sem. lessons, presentation, group work, presentation of seminar paper

5 Participation requirements:

Formal:	
Content:	None

6	Forms of assessment: Term paper, 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) Applied Mathematics B.Sc., Biotechnology and Instrumentation Engineering B.Sc., Electrical Engineering B.Eng., Computer Engineering B.Eng., Mechanical Engineering B.Eng., Mechatronics B.Sc., Renewable Energies B.Eng. and Industrial Engineering and Management B.Sc.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Andrea Kaimann
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Fundamentals of Electrical Energy Technology					GET
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1097	150 h	5	3rd sem.	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	1	weekly hours	15	h	22.5	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	1	weekly hours	15	h	22.5	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2	Learning outcomes/competences: Graduates of the module will know the structure of electrical energy supply systems and will be able to explain the operating equipment. They can calculate and evaluate given tasks and discuss alternatives. They can name electrical machines, structure their application and describe synchronous machines and calculate and analyse their tasks as generators. Power electronic components can be named and their areas of application can be reflected and structured. The basic circuits of the power electronics are known and can be named and explained.
3	Contents: Design of transmission and distribution networks, operating resources for energy transmission and distribution, calculation of electrical energy networks with the methods of network analysis and with network calculation software. Fundamentals of electrical machines, overview of power electronic components and basic power electronic circuits in power engineering.
4	Forms of teaching: Lecture and sem. lessons with exercises and practical course
5	Participation requirements: Formal: None Content: Confident in complex computing, reliable and confident in the use of network analysis.
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) Renewable Energies B.Eng.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Jan Boris Loesenbeck
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Computer Science 1					INF1
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1107	150 h	5	3rd sem.	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	1	weekly hours	15	h	22.5	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	1	weekly hours	15	h	22.5	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

The students develop procedural programmes consisting of a few functions. To do this, they use the standard functions of an integrated development environment with editor, compiler, linker and debugger and use the functions of the respective standard library, especially for mathematical operations, for input/output on the screen and for handling files. They design small algorithms using aids such as structure diagrams or programme flow charts. They methodically search for errors. They take into account the possibilities and limits of different representations of numbers and strings.

3 Contents:

- Overview of the basics and history of computer science
- Structure and functioning of a digital computer
- Dealing with an integrated development environment
- Basic number representations (integers, floating point) and their arithmetic
- Encoding of characters and strings
- Basic constructs of procedural programming in a language like C (primitive and compound data types, control instructions, etc.)
- Design of algorithms, also with aids such as structure diagrams and programme flow charts
- Avoid and search for errors
- Functions of the standard library for mathematical operations, for input/output on the screen and for handling files
- Dynamic memory requirements

4 Forms of teaching:

Lecture, sem. lessons, practical programming tasks within the framework of the 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 and course assessment

Application of the module (in the following study programmes)

8	Renewable Energies B.Eng.

9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Wolfram Schenck
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Computer Science 2					INF2
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1111	150 h	5	4th sem.	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	1	weekly hours	15	h	22.5	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	1	weekly hours	15	h	22.5	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

The students develop object-oriented programmes with graphical, event-based interfaces comprising up to half a dozen classes. To do this, they use a corresponding class library and a graphical editor. They design object-oriented programmes methodically with the help of standardised diagrams and by utilising existing classes, especially for strings, containers and streams. They build and analyse software with the help of object-oriented design patterns. They take common sources of errors into account and inspect software for errors in a methodical fashion.

3 Contents:

- Theory and practice of object-oriented software development in a current programming language using example problems predominantly from the technical field
- Handling of an integrated development environment, in particular an editor for building graphical user interfaces
- Event-oriented programming
- Graphical design tools, for example UML class diagrams
- Using existing class libraries, in particular the respective standard class library
- Support for strings, files and streams
  Generic containers
- Error handling, exceptions
- Basic object-oriented software design patterns

4 Forms of teaching:

Lecture, sem. lessons, practical course

5 Participation requirements:

Formal:	None
Content:	Computer Science 1 (1107)

6 Forms of assessment:

Written 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)

Renewable Energies B.Eng.

9 Importance of the grade for the final grade:

according to BRPO

10	Module coordinator: Prof. Dr. rer. nat. Jörn Loviscach
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Investment and Financing					FIN
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1118	150 h	5	2nd, 4th or 6th sem.	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	3	weekly hours	45	h	67.5	h
	Sem. lessons	30 students	1	weekly hours	15	h	22.5	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	0	weekly hours	0	h	0	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

The students gain knowledge of the methods of investment calculation and of the basic forms of financing in their possibilities and limits. They can assess the importance of rational investment and financing decisions for the success of a company. They are familiar with the various instruments of investment appraisal and can apply them to specific cases and evaluate the calculation results realised with regard to the practical implementation of investment decisions. Students know the basic forms of finance and can classify them. Students can allocate the appropriate forms of financing to different financing occasions. They are able to calculate the financing costs and make justified decisions regarding the suitability of the respective forms of financing.

3 Contents:

- Basic concepts of investment and financing
- Methods of static investment calculation
- Methods of dynamic investment calculation
- Forms of external financing
- Forms of internal financing

4 Forms of teaching:

Lecture, sem. lessons

5 Participation requirements:

Formal:	
Content:	Knowledge of the contents of the module General Business Administration (1002 or 1024)

6 Forms of assessment:

Written examination, combination examination, performance 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)

Engineering Computer Sciences B.Eng, Renewable Energies B.Eng. and Industrial Engineering and Management B.Sc.

9 Importance of the grade for the final grade:

according to BRPO

10 Module coordinator:

Prof. Dr. rer. pol. Hubertus Wameling

Other information:

11	Literature will be announced at the beginning of the course.

	Renewable Energies study programme: Elective module
12	Language: German

Colloquium					KOL
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1290	90 h	3	6th or 7th sem.	each semester	

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	0	weekly hours	0	h	90	h
	Sem. lessons	30 students	0	weekly hours	0	h	0	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	0	weekly hours	0	h	0	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2	Learning outcomes/competences: The colloquium is to be assessed as an independent examination. It serves to determine whether the candidate is capable of orally presenting and independently justifying the scientific topic of the bachelor thesis, its subject-related foundations, its interdisciplinary connections and its non-subject-related references, as well as its significance for practical applications.
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 bachelor thesis
5	Participation requirements: Formal: None Content: Treatment of the bachelor 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) Applied Mathematics B.Sc., Biotechnology and Instrumentation Engineering B.Sc., Electrical Engineering B.Eng., Computer Engineering B.Eng., Mechanical Engineering B.Eng., Mechatronics B.Sc., Renewable Energies B.Eng. and Industrial Engineering and Management B.Sc.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: N.N.
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Power Electronics					LE
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1138	150 h	5	5th sem.	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	1	weekly hours	15	h	22.5	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	1	weekly hours	15	h	22.5	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

Students will be able to

- understand power electronic components in their function and diversity, from simple dimmers in lighting and household appliances to three-phase frequency converters in three-phase applications
- acquire knowledge of electromagnetic compatibility (EMC) for the interference-free interaction of micro- and power electronics
- establish power balances with regard to the harmonics

3 Contents:

- Functional principle of commutatorless, line-commutated and self-commutated converter circuits (W1, W3, B2, B6)
- Rectifier, inverter, converter and four-quadrant operation
- Efficiencies, harmonics (Fourier), power calculations
- Control, protection and cooling of power electronic components
- Three-phase drives with IGBT frequency converter (space vector modulation)
- Mains-friendly power converters with Power Factor Control (PFC)
- Monolithic fusion of power electronics (energy) and microelectronics (information) on one semiconductor chip (power chips)
- Innovative fields of application of power electronics in automation technology, in electric vehicles and in decentralised energy management

Laboratory practicals:

1. Commutatorless converter circuit
2. Mains-operated power converter circuit
3. Self-guided converter circuit

4 Forms of teaching:

Lecture, sem. lessons and practical training in small groups (3–4 participants)

5 Participation requirements:

Formal:	None
Content:	Modules on Electrical Machines (1059) and Drive Technology (1013) should be successfully completed

6 Forms of assessment:

Written examination or oral examination

7 Prerequisite for the award of credit points:

Module examination pass and course assessment

Application of the module (in the following study programmes)

8	Electrical Engineering B.Eng, Engineering Computer Sciences B.Eng and Renewable Energies B.Eng.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Jan Boris Loesenbeck
11	Other information: Literature will be announced at the beginning of the course. Students must have sufficient knowledge and experience in the use and safety of electrical equipment. Renewable Energies study programme, specialisation in Energy Efficient Systems: Elective subject
12	Language: German

Mathematics1					MA1
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1150	300 h	10	1st sem.	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		actual contact time / classroom teaching		Self-study	
	Lecture	60 students	4	weekly hours	60	h	90	h
	Sem. lessons	30 students	4	weekly hours	60	h	90	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	0	weekly hours	0	h	0	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

The students manipulate real-valued and complex-valued expressions formed from elementary functions in a target-oriented manner, solve corresponding equations and take domains of definition as well as and ambiguities into account. They sketch the graphs of composite real-valued functions and estimate their value without aids. They apply derivatives to linear approximation and model simple growth or decay problems using derivatives. They solve basic integrals and transfer the concept of the integral to applications such as determining the centre of gravity or volume. They model basic stochastic settings with the help of probabilities and random variables. They use basic computer algebra and computer numerics and take the limitations of these into account.

3 Contents:

- Sets; number systems N to C
- Basics of logic; methodical solving of equations and inequalities
- Functions (powers, roots, exponential functions, logarithms, polynomial functions, rational functions, trigonometric functions including calculations on the general plane triangle) Euler's formula; polar representation of complex numbers
- Sequences, limits of sequences and of functions
- Derivative, derivation rules, linear approximation, extrema
- Integral, integration rules, length, area and volume
- Combinatorics; basics of stochastics
- Fundamentals of numerics; numerical methods of the treated areas; basic applications of mathematical software

4 Forms of teaching:

Lecture, sem. lessons

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)

Renewable Energies B.Eng.

9 Importance of the grade for the final grade:

	according to BRPO
10	Module coordinator: Prof. Dr. rer. nat. Jörn Loviscach
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Mathematics 2					MA2
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1156	300 h	10	2nd sem.	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		actual contact time / classroom teaching		Self-study	
	Lecture	60 students	4	weekly hours	60	h	90	h
	Sem. lessons	30 students	4	weekly hours	60	h	90	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	0	weekly hours	0	h	0	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

Students model geometric situations with the help of vectors and matrices. They solve systems of linear equations methodically. They set up differential equations for given, in particular technical, applications, solve them and discuss the practical significance of the solutions. They use power series to approximate functions, noting the limitations of the validity of these approximations. They apply Fourier series to the analysis and synthesis of periodic functions. They solve differential equations with the help of the Laplace transform. With the help of graphical methods, they obtain an overview of the behaviour of a function of several variables. They determine volumes and similar quantities through multidimensional integration. For the above tasks, they apply functions of computer numerics and computer algebra systems and take the limitations of these into account.

3 Contents:

- Vectors, scalar product, vector product, linear equations, plane equations
- Matrices
- Determinants
- Eigenvalues and eigenvectors
- Linear systems of equations and basic solution methods thereof
- Fundamentals of setting up and solving ordinary differential equations, in particular linear differential equations with constant coefficients as well as separable differential equations
- Power series; approximations by Taylor series
- Fourier series
- Laplace transform, in particular for solving linear differential equations
- Functions of several variables: Gradient, extrema, multiple integrals
- Basic numerical methods in the fields covered; applications of mathematical software

4 Forms of teaching:

Lecture, sem. lessons

5 Participation requirements:

Formal:	None
Content:	Mathematics 1 (1150)

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) Renewable Energies B.Eng.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr. rer. nat. Jörn Loviscach
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Metrology					MT
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1169	150 h	5	3rd or 5th sem.	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	1	weekly hours	15	h	22.5	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	1	weekly hours	15	h	22.5	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

The students know the general principles of metrology and the basic electrical measuring methods. They know the causes of measurement deviations and the basics of error calculation. They know how digital and electromechanical measuring instruments work in principle and can handle measuring instruments. After completing the module, they will be able to select a device suitable for a measurement task, design a measurement circuit, perform the measurements, present the measurement results in a suitable manner and perform an error analysis.

3 Contents:

- Basics, basic circuits
- Digital and electromechanical measuring instruments
- Error calculation and causes of measurement deviations
- Measurement of electrical quantities
- Stationary and dynamic behaviour of measuring systems

4 Forms of teaching:

Lecture, sem. lessons and practical course

5 Participation requirements:

Formal:	none Modules: 1075 Electrical Engineering 2
Content:	

6 Forms of assessment:

Written examination; each 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 B.Eng, Engineering Computer Sciences B.Eng and Renewable Energies B.Eng.

9 Importance of the grade for the final grade:

according to BRPO

10 Module coordinator:

Prof. Dr. rer. nat. Thomas Westerwalbesloh

11 Other information:

Literature will be announced at the beginning of the course.

12 Language:

German

Modern Energy Policy					MEP
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1176	150 h	5	6th sem.	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	2	weekly hours	30	h	45	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	0	weekly hours	0	h	0	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2	Learning outcomes/competences: After completion of the module, students are able to lead a discourse on current topics of energy policy and to discuss them in the group, to develop a strategy concept and to publicly present technical projects. As well as politically assess the consequences of technology and manage information successfully.
3	Contents: Treatment of technical energy projects, e.g. - E-mobility - Wind energy projects - Solar energy use - Biomass and agriculture - Water and wastewater management Legal framework of energy policy, e.g. - EU framework on energy efficiency - National and EU law on the energy industry - Energy industry structures and trade flows
4	Forms of teaching: Lecture and seminar
5	Participation requirements: Formal: None Content: None
6	Forms of assessment: Term paper or oral examination
7	Prerequisite for the award of credit points: Module examination pass
8	Application of the module (in the following study programmes) Renewable Energies B.Eng.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Jan Boris Loesenbeck
11	Other information: Literature will be announced at the beginning of the course. Regular seminar participation qualifies for the module examination
12	Language: German

Personnel and Organisation					PUO
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1192	150 h	5	4th or 6th sem.	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	3	weekly hours	45	h	67.5	h
	Sem. lessons	30 students	1	weekly hours	15	h	22.5	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	0	weekly hours	0	h	0	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

The students have a basic overview of the tasks of human resource management. They know the essential methods of personnel recruitment, personnel development and personnel evaluation and can evaluate them with regard to their suitability and applicability.
They are familiar with essential theoretical concepts on communication; they understand the problems that can occur during the communication process and have practised possible solutions.
They understand the importance of learning for change processes and can design the conditions for successful learning.
They can explain the principles of organisational theory and have checked their significance using practical examples. They can use organisational forms with regard to their applicability.
They are familiar with important topics of organisational change and can assess their significance for entrepreneurial activity.
They have basic knowledge about the characteristics and significance of key qualifications and have demonstrated this with examples, e.g. regarding the conflict resolution and motivational skills.

3 Contents:

Significance, goals and tasks of human resources management
Fundamentals of labour law
Fundamentals of Communication
Fundamentals of Learning Theory
Environmental conditions, learning control, strategies for lifelong learning
Organisational structure and process organisation, forms of primary and secondary organisation
Organisational change
Personnel management and conflict resolution

4 Forms of teaching:

Lecture, sem. lessons with exercises and case studies

5 Participation requirements:

Formal:	None
Content:	None

6 Forms of assessment:

	Written examination, combination examination, performance 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) Engineering Computer Sciences B.Eng, Renewable Energies B.Eng. and Industrial Engineering and Management B.Sc.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr. rer. oec. Thomas Süße
11	Other information: Literature will be announced at the beginning of the course. Renewable Energies study programme: Possible elective subject
12	Language: German

Photovoltaics					PHV
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1193	150 h	5	6th sem.	Annual (Summer)	1 semester

	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
1	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	1	weekly hours	15	h	22.5	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	1	weekly hours	15	h	22.5	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2	Learning outcomes/competences: Students understand the basic structure of photovoltaic systems and their components. They plan photovoltaic systems, e.g. with simulation software, and compare the results with measurement results of the PV systems on the roof of the university building. The students can categorise the results in the context of research and development.
3	Contents: - Structure and function of solar cells - Manufacturing process of solar cells and solar modules - Components of photovoltaic systems - Inverter technology - Safety of photovoltaic systems - State of research and development
4	Forms of teaching: Lecture, sem. lessons with exercises and 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 and course assessment
8	Application of the module (in the following study programmes) Renewable Energies B.Eng.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Eva Schwenzfeier-Hellkamp
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Physics 1					PH1
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1198	150 h	5	1st sem.	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	1	weekly hours	15	h	22.5	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	1	weekly hours	15	h	22.5	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

The students are familiar with the SI system and confidently transform physical quantities and units. They have an overview of the structure and methodology of physics and basic knowledge of the fundamental natural laws of mechanics. The students can analyse and mathematically describe the movement processes of mass points and simple bodies. They know the elementary principles of the mechanics of stationary and moving liquids and gases. The students have initial experience in recognising problem contexts and in the methods of solving technical problems independently.

The students have acquired initial skills in simple experimentation and in the preparation of experimental reports. They know the methods of error analysis and can apply them to their own measurement data. The students can compare their practical measurement results with theoretical expectations and have carried out a systematic analysis with the help of simple examples.

3 Contents:

- Physical quantities: Notations, rules, unit systems
- Basic concepts of mechanics
- Kinematics: Translation and rotation
- Newtonian mechanics: Mass, force, momentum, moment of inertia, torque, angular momentum
- Work and energy
- Conservation laws of energy, momentum, angular momentum
- Shock laws
- Mechanics of liquids and gases at rest
- Basic concepts of fluid mechanics

4 Forms of teaching:

Lecture, seminar with practice-oriented exercises, basic physics practical course – Part 1 (3 experiments)

5 Participation requirements:

Formal:	None
Content:	None

6 Forms of assessment:

Written examination; each 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)

Renewable Energies B.Eng.

9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr. rer. nat. Sonja Schöning
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Physics 2					PH2
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1202	150 h	5	2nd sem.	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	1	weekly hours	15	h	22.5	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	1	weekly hours	15	h	22.5	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

The students know the elementary basics of thermodynamics. They can analyse oscillations and waves and describe them mathematically.
Students understand the essential principles of the formation and properties of imaging through ray optics. They know the terms coherence, interference and diffraction. Students recognise problem interrelationships and can solve technical problems independently. Students are familiar with the skills of simple experimentation and the presentation of measurement results. They have practised the error analysis of measurement results and the preparation of reports on the laboratory experiments of the practical course. The students can systematically analyse their experimental results.

3 Contents:

- Thermodynamics: Heat theory, gas laws, main theorems, real gases, heat transport, radiation laws
- Vibrations: Basic terms, free undamped vibration, free damped vibration, forced vibration, coupled vibration
- Waves: Basic concepts of the nature and mathematical description of a wave, standing waves. Interference and diffraction, Doppler effect
- Geometrical optics / basic concepts of ray optics, refraction, imaging with mirrors and lenses, simple optical devices, imaging errors
- Elements of wave optics

4 Forms of teaching:

Lecture, seminar with practice-oriented exercises, basic physics practical course – Part 2 (3 experiments)

5 Participation requirements:

Formal:	
Content:	Contents of the module Physics 1 (1198) including practical Module: 1198 Physics 1

6 Forms of assessment:

Written examination; each 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)

Renewable Energies B.Eng.

9 Importance of the grade for the final grade:

	according to BRPO
10	Module coordinator: Prof. Dr. rer. nat. Sonja Schöning
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Practical Project / Internship					PRA
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1292	450 h	15	7th sem.	each semester	12 weeks

1	Course:	Planned group sizes	Scope		Actual contact time /classroom teaching		Self-study	
	Lecture	60 students	0	weekly hours	0	h	450	h
	Sem. lessons	30 students	0	weekly hours	0	h	0	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	0	weekly hours	0	h	0	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2	Learning outcomes/competences: In the work term, the activities and learning outcomes imparted in the course of study are to be applied in a practice-oriented manner. To this end, students should work independently on engineering projects and develop suitable solution strategies. The main aim is to develop and expand integration, analysis and problem solving, presentation and communication skills.
3	Contents: The contents result from the field of activity of the respective chosen company or enterprise and should include an engineering task. At the end of the work term, the supervising company is to prepare an activity report and the students a final report. During the practical phase, the students should receive individual and professional advising from the supervising university lecturers.
4	Forms of teaching: Sem. lessons with exercises as accompanying guidance
5	Participation requirements: Formal: None Content: None
6	Forms of assessment: Term paper
7	Prerequisite for the award of credit points: Module examination pass
8	Application of the module (in the following study programmes) Electrical Engineering B.Eng., Engineering Computer Sciences B.Eng., Mechanical Engineering B.Eng., Mechatronics B.Sc., Renewable Energies B.Eng. and Industrial Engineering and Management B.Sc.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: N.N.
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Product and Price Management					PPM
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1209	150 h	5	5th sem.	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	3	weekly hours	45	h	67.5	h
	Sem. lessons	30 students	1	weekly hours	15	h	22.5	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	0	weekly hours	0	h	0	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2	Learning outcomes/competences: Students have basic knowledge of the tools of operational marketing and can classify them as practical implementation tools of strategic marketing. They gain knowledge of the methods and design tools of programme, product and pricing policy and can evaluate their possibilities and limits. The students understand the mode of action of the operative market control instruments and can apply them in a targeted manner. Students acquire the competence to develop concepts for the marketing of products throughout their entire life cycle and to evaluate their practicality.
3	Contents: • Overview of the instruments of operational marketing • Programme policy • Product policy • Contracting policy • Basic concepts of distribution policy
4	Forms of teaching: Lecture, sem. lessons
5	Participation requirements: Formal: None Content:
6	Forms of assessment: Written examination, combination examination, performance 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) Mechatronics B.Sc., Renewable Energies B.Eng. and Industrial Engineering and Management B.Sc.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr. rer. oec. Klaus Rüdiger
11	Other information: Literature will be announced at the beginning of the course. Renewable Energies study programme: possible elective subject to be chosen
12	Language: German

Product Risk Management					PRM
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1210	150 h	5	4th or 6th sem.	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	2	weekly hours	30	h	45	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	0	weekly hours	0	h	0	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

The students possess the technical and methodological competences with regard to risk identification, analysis and assessment for technical products. They can use the instruments required for this in relation to different technical products and develop instruments for risk minimisation for these products and evaluate the success of the measures introduced under technical and business management aspects.

3 Contents:

- Product life cycle
- Product development process
- Innovation management
- Quality management
- Project management
- Technical risk management
- Risk types/ risk identification

....Methods of risk analysis and risk ranking
....Methods of technical and economic risk assessment
....Risk management instruments and processes
....Integration of risk management into the product development cycle
....Instruments of evaluation and documentation

- Supplier management

4 Forms of teaching:

Lecture, sem. lessons with exercises/case studies.

5 Participation requirements:

Formal:	None
Content:	None

6 Forms of assessment:

Term paper, 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)

Renewable Energies B.Eng. and Industrial Engineering and Management B.Sc.

9 Importance of the grade for the final grade:

according to BRPO

10 Module coordinator:

Prof. Dr.-Ing. Eva Schwenzfeier-Hellkamp

Other information:

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

Project 1					PR1
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1220	150 h	5	4th sem.	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	0	weekly hours	0	h	0	h
	Sem. lessons	30 students	0	weekly hours	0	h	0	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	2	weekly hours	30	h	120	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

The students master the methods and tools for the creation or development of a technical product or project. They acquire the competence to work goal-oriented in small organisational units and to present their project results with the help of suitable software tools (e.g. MS PowerPoint). Critical comparison and examination leads to linked thinking and action. Students acquire key competences such as teamwork and communication skills.

3 Contents:

- Project management
- Structuring tasks in product/project development
- Sequence of problem solving using a simple technical example from everyday life in engineering education
- Literature review
- Engineering work
- Presentation techniques

4 Forms of teaching:

Project with presentation of the project results

5 Participation requirements:

Formal:	None
Content:	None

6 Forms of assessment:

Project work

7 Prerequisite for the award of credit points:

Module examination pass and course assessment

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

Renewable Energies B.Eng.

9 Importance of the grade for the final grade:

according to BRPO

10 Module coordinator:

Prof. Dr.-Ing. Eva Schwenzfeier-Hellkamp

11 Other information:

Literature will be announced at the beginning of the course. Independent research when preparing the project work

12 Language:

German

Project 2					PR2
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1221	150 h	5	5th sem.	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	0	weekly hours	0	h	0	h
	Sem. lessons	30 students	0	weekly hours	0	h	0	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	2	weekly hours	30	h	120	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

The students master the methods and tools for the creation or development of a technical product or project. They acquire the competence to work goal-oriented in small organisational units and to present their project results with the help of suitable software tools (e.g. MS PowerPoint). Critical comparison and examination leads to linked thinking and action. Students acquire key competences such as teamwork and communication skills.

3 Contents:

- Project management
- Structuring tasks in product/project development
- Process of problem solving using a technical example from everyday life in engineering education
- Literature review
- Engineering work
- Presentation techniques

4 Forms of teaching:

Project with presentation of the project results

5 Participation requirements:

Formal:	None
Content:	None

6 Forms of assessment:

Project work

7 Prerequisite for the award of credit points:

Module examination pass and course assessment

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

Renewable Energies B.Eng.

9 Importance of the grade for the final grade:

according to BRPO

10 Module coordinator:

Prof. Dr.-Ing. Eva Schwenzfeier-Hellkamp

11 Other information:

Faculty tutoring in each case by a lecturer from the study programme, chosen by the student him/herself.

12 Language:

German

Automatic Control Engineering					RT
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1235	150 h	5	4th sem.	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	1	weekly hours	15	h	22.5	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	1	weekly hours	15	h	22.5	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

The students master

- the description and analysis of linear, time-invariant systems in the time domain and frequency domain,
- the design of single-loop control loops by means of root locus curve and frequency response methods
- the basic features of digital regulations

3 Contents:

- Basic concepts of control engineering
- Description and analysis of linear, time-invariant systems in the time domain and frequency domain
- Properties of single-loop control loops in the time and frequency domain
- Design of single-loop control loops by means of root locus curve and frequency response methods
- Basic features of digital regulations

4 Forms of teaching:

Lecture with accompanying seminar exercises and practicals

5 Participation requirements:

Formal:	None
Content:	Modules Mathematics 1 (1146 or 1150) and 2 (1152 or 1156) and Electrical Engineering 1 (1071 or 1074) and 2 (1075 or 1077) should have been completed

6 Forms of assessment:

Written examination; each 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 B.Eng. and Renewable Energies B.Eng.

9 Importance of the grade for the final grade:

according to BRPO

10 Module coordinator:

Prof. Dr.-Ing. Dirk Weidemann

11 Other information:

Literature will be announced at the beginning of the course.

12	Language: German

Renewable Energy Industry					RW
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1238	150 h	5	1st sem.	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	2	weekly hours	30	h	45	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	0	weekly hours	0	h	0	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

The students know the range of activities of engineers in the field of renewable energies. They are sensitised to current technological problems/trends and are able to grasp these in their interdisciplinary complexity and their economic and technical significance.
They have mastered the basics of scientific work and can use this as a basis for working out issues in a team and communicating them in presentations to fellow students as well as discussing them with them.

3 Contents:

- Situation and potential of the energy markets, national and international
- Sector analysis: Solar energy, wind power, hydropower, geothermal energy, use of biomass
- Labour market in the sectors
- Range of tasks/job market prospects for the engineer in the field of renewable energies
- Excursion to regional companies/ presentation by external speakers
- Introduction to the basics of scientific work and presentation techniques through presentations by the students

4 Forms of teaching:

Lecture with accompanying seminar. Event with active participation of all students.

5 Participation requirements:

Formal:	None
Content:	None

6 Forms of assessment:

Term paper, written examination or project work

7 Prerequisite for the award of credit points:

Module examination pass and course assessment

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

Renewable Energies B.Eng.

9 Importance of the grade for the final grade:

according to BRPO

10 Module coordinator:

Prof. Dr.-Ing. Eva Schwenzfeier-Hellkamp

11 Other information:

Literature will be announced at the beginning of the course. Independent research when preparing the project work

12	Language: German

Sensors					SEN
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1243	150 h	5	5th sem.	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	2	weekly hours	30	h	45	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	0	weekly hours	0	h	0	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

The students have an overview of the most important sensor types and understand the essential principles of their physical function.
The students have a basic knowledge of the methodical linking of physics, micromechanics and electronics in sensor development. They are able to solve practical problems, especially in the field of the generation and use of renewable energies, as well as apply and design suitable new sensor systems.

3 Contents:

- Sensors: Terms, overview of usable effects, use and selection
- Functionality and application of selected sensors, especially in the field of generation and use of renewable energies, e.g.
  Optical transducers and sensors
  Sensors for temperature measurement
  Sensors: for position detection and for recording mechanical and fluidic variables,
  Sensors for detecting paths and angles
  Detection of chemical and biological substance variables, fluidic variables, sensor networking

4 Forms of teaching:

Lecture, seminar

5 Participation requirements:

Formal:	None
Content:	Modules: 1064 Electronics; 1074 Electrical Engineering 1; 1077 Electrical Engineering 2; 1169 Metrology; 1198 Physics 1; 1202 Physics 2;

6 Forms of assessment:

Oral examination

7	Prerequisite for the award of credit points: Module examination pass
8	Application of the module (in the following study programmes) Renewable Energies B.Eng.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr. rer. nat. Sonja Schöning
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Technical English 1					FSE1
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1085	150 h	5	1st or 3rd sem.	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture		0	weekly hours	0	h	0	h
	Sem. lessons	30 students	4	weekly hours	60	h	90	h
	Exercise		0	weekly hours	0	h	0	h
	Practical or seminar		0	weekly hours	0	h	0	h
	Supervised self-study	30 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

- Expertise: Students demonstrate that they have extended their active general language competence from B1.2 and achieved a B2.1 level. They possess a sound basic vocabulary of technical English and master the contextually relevant grammar. They communicate spontaneously and fluently in engineering job situations. They formulate issues confidently, clearly and in detail in English both in speaking and writing.
- Social competence: They try out and consolidate communicative key skills in English presentations, teamwork and project work.
- Methodological competence: They use targeted strategies for content acquisition and critical analysis of technical texts and for solving contextual tasks. They can present technical issues in a way that is appropriate for the target group.
- Personal competence: They are able to take responsibility for their learning process; they research and structure authentic material, organise workloads and meet deadlines.

3 Contents:

- The students can describe relevant engineering disciplines.
- They master the core terminology of the technical topic (e.g. base units in engineering; dimensions and shapes; mathematical operations; forces and mechanisms; properties of materials; manufacturing and automation; energy and electricity; logistics; data processing and transmission).
- They possess interdisciplinary skills (emailing; project work; presentation techniques; discussing diagrams).

4 Forms of teaching:

Sem. lessons, individual and group work, etc.

Semester project (Assignment)

5 Participation requirements:

Formal:	None
Content:	English language competence: B1.2 (according to the European Reference Framework for Languages)

6 Forms of assessment:

Combination examination

7	Prerequisite for the award of credit points: 70% attendance and active participation; passed semester project and written exam
8	Application of the module (in the following study programmes) Electrical Engineering B.Eng, Engineering Computer Sciences B.Eng and Renewable Energies B.Eng.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Dr. phil. Anna Trebits
11	Other information: Literature will be announced at the beginning of the course. Textbook, additional materials, intranet self-study courses
12	Language: English

Technical English 2					FSE2
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1086	150 h	5	4th or 6th semester	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture		0	weekly hours	0	h	0	h
	Sem. lessons	30 students	4	weekly hours	60	h	90	h
	Exercise		0	weekly hours	0	h	0	h
	Practical or seminar		0	weekly hours	0	h	0	h
	Supervised self-study	30 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

- Expertise: The students have an extended active language competence of the upper B2.2 level. They enhance their Technical English vocabulary and can combine it with expressions from Business English.
- Social competence: they develop sensitivity to differences in intercultural communication, especially in English-speaking business environments.
- Methodological competence: They are able to skim technical texts for essential information. They present them shortly and concisely, both in speaking and in writing. They establish wider contexts and make a critical assessment.
- Personal competence: They show English fluency and a pro-active approach to managing authentic English sources.

3 Contents:

- Students can actively participate in international conferences.
- They master the core terminology for dealing with problem-oriented case studies (e.g. Industry 4.0; automated systems; discussing readings and trends).
- They possess interdisciplinary skills (e.g. project management; business plan and marketing; economic sectors, manufacturing pro- cesses; pitching a technical product; conference posters; academic writing; persuasion strategies).

4 Forms of teaching:

Sem. lessons, individual and group work, etc.

Seminar project (Assignment)

5 Participation requirements:

Formal:	Modules: 1085 Technical English 1;
Content:	English language competence: B2.1 (according to the European Reference Framework for Languages)

6 Forms of assessment:

Combination examination

7	Prerequisite for the award of credit points: 70% attendance and active participation, passed semester project and written exam
8	Application of the module (in the following study programmes) Electrical Engineering B.Eng, Engineering Computer Sciences B.Eng and Renewable Energies B.Eng.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Dr. phil. Anna Trebits
11	Other information: Literature will be announced at the beginning of the course. Textbook, course supplementary materials self-study courses Study programmes in Electrical Engineering, Engineering Computer Sciences, Renewable Energies: Elective subject
12	Language: English

Textile Technologies					TEX
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
6004	150 h	5	4th or 6th sem.	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	2	weekly hours	30	h	45	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	0	weekly hours	0	h	0	h
	Supervised self study	60 students	0	weekly hours	0	h	0	h
2	Learning outcomes/competences: Describing the textile chain, comparing different textile fabrics and materials, indicating the most important textile testing procedures and recent research topics. Students describe, analyse and assess a topic from the textile chain independently.							
3	Contents: Textile chain: primary spinning, secondary spinning, weaving, warp and weft knitting, braiding, narrow textiles, finishing, manufacture; textile machines; sustainability in the textile chain; intelligent / functional textiles; physical and other properties of textiles; standards; textile testing instruments. Recent research topics along the textile chain.							
4	Forms of teaching: Lecture, hands-on seminar							
5	Participation requirements:							
	Formal:							
	Content:							
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) Biotechnology and Instrumentation Engineering B.Sc., Mechatronics B.Sc., Renewable Energies B.Eng. and Industrial Engineering and Management B.Sc.							
9	Importance of the grade for the final grade: according to BRPO							
10	Module coordinator: Prof. Dr. Dr. Andrea Ehrmann							
11	Other information:							
12	Language: English							

Thermal Use of Renewable Energies					TNE
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1266	150 h	5	6th sem.	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	1	weekly hours	15	h	22.5	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	1	weekly hours	15	h	22.5	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

The students know the basics of the supply and utilisation of renewable energies in the field of solar and geothermal energy. They understand the essential principles of the physical-technical aspects of solar and geothermal energy use. The students know the essential principles of the application areas and dimensioning of corresponding systems. They have acquired practical skills in the creation of solar thermal simulation models and can analyse their results.

3 Contents:

- Heating demand in residential buildings
- Solar thermal use of renewable energies in the low- and high-temperature range (including domestic hot water heating and backup heating, swimming pool heating, solar thermal power plants)
- Geothermal use. Functioning of the heat pump (geothermal heating and cooling)
- Practical course (e.g. experiments and simulations on the dimensioning of solar thermal systems for heating drinking water and swimming pools as well as on the functioning and determination of the coefficients of performance of a heat pump)

4 Forms of teaching:

Lecture, seminar, practical course

5 Participation requirements:

Formal:	
Content:	Modules: 1198 Physics 1; 1202 Physics 2;

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 B.Eng. and Renewable Energies B.Eng.

9 Importance of the grade for the final grade:

according to BRPO

10 Module coordinator:

Prof. Dr. rer. nat. Sonja Schöning

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

Thermodynamics 1					TD1
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1267	150 h	5	2nd, 4th or 6th sem.	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	2	weekly hours	30	h	45	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	0	weekly hours	0	h	0	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

Instrumental competence:
They are able to safely apply this knowledge of thermodynamics to technical issues.
Systematic competence:
It should be possible to recognise, describe and solve thermodynamic problems occurring in technical situations.
Communicative competence:
They have a communicative command of thermodynamics, can explain them argumentatively to experts and beginners and confidently present and defend questions of an unknown nature

3 Contents:

- Basic concepts such as system, equilibrium, state variables, changes, processes, thermal and caloric state variables, process variables work and heat
- 1st law of thermodynamics: stationary / moving closed systems, stationary flow processes
- Ideal gases: Thermal / caloric equation of state of ideal gases, specific heat capacity, simple changes of state of ideal gases
- 2nd law of thermodynamics: Meaning, entropy
- Circular processes: simple reversible comparative processes of ideal gases: Carnot, Joule, petrol and diesel process. Terms: Work, performance, degree of effectiveness
- Real fluids, changes of state in the two-phase region, representation in various diagrams, material data calculations and tables
- Fundamentals of heat transfer

4 Forms of teaching:

Lecture and seminar

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 B.Eng., Mechanical Engineering B.Eng. and Renewable Energies B.Eng.

9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr.–Ing. Marcel Beckmann
11	Other information: Literature will be announced at the beginning of the course. Renewable Energies study programme: Possible elective subject
12	Language: German

Elective Module					WM
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
9019	150 h	5	5th or 6th sem.	each semester	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students		weekly hours		h		h
	Sem. lessons	30 students		weekly hours		h		h
	Exercise	20 students		weekly hours		h		h
	Practical or seminar	15 students	0	weekly hours	0	h	0	h
	Supervised self-study	60 students		weekly hours		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) Renewable Energies B.Eng.
9	Importance of the grade for the final grade:
10	Module coordinator: Prof. Dr.-Ing. Eva Schwenzfeier-Hellkamp
11	Other information:
12	Language: German

Hydrogen as a Source of Energy					WVE
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer:	Duration:
1405	150	5	6th semester	Annual (Summer)	1 sem.

1	Course:	Planned group sizes:	Scope:		Actual contact time/classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	1	weekly hours	15	h	22.5	h
	Exercise	20 students		weekly hours		h		h
	Practical or seminar	15 students	1	weekly hours	15	h	22.5	h
	Supervised self-study	60 students		weekly hours		h		h

2 Learning outcomes/competences:

Upon successful completion of the module, participants will be able to describe the technologies of hydrogen's value chain and the market perspectives of hydrogen as a source of energy. They will be able to plan possible alternatives to the substitution of conventional sources of energy with hydrogen for simplified applications. Students will be able to design and calculate hydrogen production plants for specific tasks. Students will be able to analyse the use of hydrogen for various applications and derive recommendations for action.

3 Contents:

Hydrogen as a strategic source of energy
Hydrogen: Properties and safety in its use
Hydrogen production
- Overview of production processes (electrolysis, hydrocarbon reforming, pyrolytic processes, alternative production processes)
- Requirements for purification
- Importance of hydrogen colours, production costs

Hydrogen storage
- Overview of storage methods (pressure vessels, cryogenic vessels, salt caverns, metal hydride, ammonia, LOHC)

Hydrogen transport and distribution
- Gas transport, liquid transport, pipelines
- Gas station infrastructure

Use of hydrogen
- Fuel cells (function and types)
- Stationary use (home energy supply, power plant operation)
- Hydrogen use in heat engines, "hydrogen ready"
- Mobile use (vehicles, aerospace)
- Use of hydrogen in industry
- Economical comparison of the possible uses of hydrogen to other alternatives

Efficiency levels (individual technologies/entire value chain)
Perspectives of hydrogen as a source of energy

4	Forms of teaching:	
	Lecture, seminar lessons and practical course	
5	Participation requirements:	
	Formal:	
	Content:	
6	Form 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):	
	Renewable Energies B.Eng.	
9	Importance of the grade for the final grade:	
	according to BRPO	
10	Module coordinator:	
	Prof. Dr.-Ing. Jens Haubrock	
11	Other information:	
12	Language:	
	German	

Wind and Hydropower					WWK
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1283	150 h	5	5th sem.	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	2	weekly hours	30	h	45	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	0	weekly hours	0	h	0	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

Students apply mechanics, electrical engineering and statistical methods to determine the energy yield of typical types of wind and hydropower plants depending on the location. They evaluate the use of materials and the impact on the environment quantitatively and qualitatively. They determine the effects of feeding wind power into the electrical grid and comment on the resulting problems and possible remedies. Students weigh up the advantages and disadvantages of different types of systems and critically evaluate new turbine designs.

3 Contents:

- Causes of wind
- Physical principles of wind turbines (drag, lift, Betz's law, ...)
- Generator concepts for wind turbines
- Grid connection, system services
- Control strategies for wind turbines
- Wind statistics, yield forecast
- Wind farms, offshore
- Environmental factors of wind turbines: noise, shadow, effects on animals, recycling, life cycle analysis, ...
- Approval procedure
- Physical principles of hydropower plants (Bernoulli's theorem), specific effects (cavitation, pressure surge)
- Typical designs of hydro turbines, hydropower plants and pumped storage power plants
- Environmental factors of hydropower plants
- Promotion of wind power and hydropower under the German law (EEG)
- Volatility and how to deal with it
- Alternative designs of wind or hydropower plants and assessments of them

4 Forms of teaching:

Lecture, sem. lessons

5 Participation requirements:

Formal:	None
Content:	Physics 1 (1198) and 2 (1202), Fundamentals of Energy Technology (1097)

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) Renewable Energies B.Eng.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr. rer. nat. Jörn Loviscach
11	Other information: Literature will be announced at the beginning of the course.
12	Language: German

Circular Economy According to Cradle to Cradle					ZW
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1324	150 h	5	5th Semester	Annual (Winter)	1 semester

1	Course:	Planned group sizes	Scope		actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	2	weekly hours	30	h	45	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	0	weekly hours	0	h	0	h
	Supervised self study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

The students have understood the consequences of linear systems and can also illustrate them. They know the concepts of Cradle to Cradle (C2C) and Circular Economy (CE) as well as their basics and related approaches. They can clearly differentiate between the conventional models and the new model of the circular economy. They are able to transfer these to system solutions and apply them in project examples. They have the competence to develop products and systems in value chains according to C2C/CE and to communicate them accordingly.

3 Contents:

- Cradle to Cradle, Circular Economy
- Procedure for the development of new products, designs and processes
- Concepts for decoupling economic growth from raw material consumption
- Influence of digitalisation / Industry 4.0
- Consideration of creative processes for new products with new designs and materials, new services and business models
- Answers to the important questions:
  - What are the effects of the current linear economic system and how can we overcome it?
  - How can we design material cycles in such a way that they have a positive impact on people, the economy and the environment?
  - How can we do things better in a sustainable way and do more than just reduce, avoid and downcycling?
  - How do we form a fundamentally new resource economy and create a broad platform for innovation that promotes positive impact and quality?
- Impulses by representatives of companies for the practical presentation of successful practical examples

4 Forms of teaching:

Lecture, sem. lessons with exercises

5 Participation requirements:

Formal:	
Content:	

6 Forms of assessment:

Term paper or project work

7	Prerequisite for the award of credit points: Module examination pass
8	Application of the module (in the following study programmes) Renewable Energies B.Eng.
9	Importance of the grade for the final grade: according to BRPO
10	Module coordinator: Prof. Dr.-Ing. Eva Schwenzfeier-Hellkamp
11	Other information:
12	Language: German

State Space Control					ZRG
Identification number:	Workload:	Credits:	Study semester:	Frequency of the offer	Duration:
1287	150 h	5	5th sem.	Annual (Summer)	1 semester

1	Course:	Planned group sizes	Scope		Actual contact time / classroom teaching		Self-study	
	Lecture	60 students	2	weekly hours	30	h	45	h
	Sem. lessons	30 students	1	weekly hours	15	h	22.5	h
	Exercise	20 students	0	weekly hours	0	h	0	h
	Practical or seminar	15 students	1	weekly hours	15	h	22.5	h
	Supervised self-study	60 students	0	weekly hours	0	h	0	h

2 Learning outcomes/competences:

The students master

- the description of linear single- and multi-variable systems in the state space,
- the transformation of the state space representation to diagonal, Jordan, control, observation normal form and input/output normal form as well as the determination of the corresponding transformation matrices,
- the design of state controllers,
- the design of state observers.

3 Contents:

- Description of linear single- and multi-variable systems in the state space
- Structural system properties: Stability, controllability, observability
- State transformations: Diagonal, Jordan, control, observational and input/output normal shapes
- Controller design by means of eigenvalue specification
- Design of state observers

4 Forms of teaching:

Lecture with accompanying seminar exercises and practicals.

5 Participation requirements:

Formal:	None
Content:	Control Engineering (1235), Automation Engineering (1015)

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)

Renewable Energies B.Eng.

9 Importance of the grade for the final grade:

according to BRPO

10 Module coordinator:

Prof. Dr.-Ing. Dirk Weidemann

11 Other information:

Literature will be announced at the beginning of the course.

12 Language:

German