Course Handbook Electrical Engineering - Renewable Energy and System Technology Master

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Head of Studies	Prof. Dr. Albrecht Kunz
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Electrical Engineering - Renewable Energy and System Technology Master - mandatory courses (overview)

Module name (EN)	Code	SAP-P	Semester	Hours per semester week / Teaching method	ECTS	Module coordinator
Data Networking Technologies	DFMEES-206	P610-0140, P610-0148	2	4VU	5	Prof. Dr.-Ing. Ahmad Osman
Electric Power Supply Systems 1	DFMEES-110	P610-0135	1	3V+1U	5	Prof. Dr. Michael Igel
Electric Power Supply Systems 2	DFMEES-210	P610-0144	2	3V+1U	4	Prof. Dr. Michael Igel
Electromagnetic Compatibility	DFMEES-106	P610-0130	1	2VU	2	Prof. Dr. Xiaoying Wang
English 1	DFMEES-103	P610-0128	1	2VU	2	Dr. Julia Frisch
English 2	DFMEES-203	P610-0139	2	2VU	2	Dr. Julia Frisch
French I	DFMEES-102	P610-0127	1	4VU	4	Dr. Julia Frisch
French II	DFMEES-202	P610-0138	2	4VU	4	Dr. Julia Frisch
German 1	DFMEES-101	P610-0126	1	4VU	4	Dr. Julia Frisch
German 2	DFMEES-201	P610-0137	2	4VU	4	Dr. Julia Frisch
Intercultural Management 1	DFMEES-104	P610-0129	1	2VU	2	Dr. Julia Frisch
	DFMEES-204	P610-0096	2	2VU	2	Dr. Julia Frisch

Module name (EN)	Code	SAP-P	Semester	Hours per semester week / Teaching method	ECTS	Module coordinator
Intercultural Management 2						
Methods and Applications of Machine Vision	DFMEES-109	P610-0134	1	4VU	5	Marc Quirin, M.Sc.
Power Electronics and Drive Systems Engineering	DFMEES-107	P610-0132	1	2V+1U+1P	5	Prof. Dr.-Ing. Stefan Winternheimer
Principles and Application of Non-Destructive Testing Methods for Quality Assurance and Component Testing	DFMEES-214	P610-0572	2	2VU	3	Prof. Dr.-Ing. Ahmad Osman
Process Automation	DFMEES-108	P610-0133	1	4PA	4	Prof. Dr. Benedikt Faupel
Software Development with C/C++	DFMEES-205	P610-0146, P610-0151	2	2V+2U	5	Prof. Dr. Reinhard Brocks
The Electric Power Industry	DFMEES-111		1	2V	2	Prof. Dr. Michael Igel

(18 modules)

Electrical Engineering - Renewable Energy and System Technology Master - optional courses (overview)

Module name (EN)	Code	SAP-P	Semester	Hours per semester week / Teaching method	ECTS	Module coordinator

(0 modules)

Electrical Engineering - Renewable Energy and System Technology Master - mandatory courses

Data Networking Technologies

Module name (EN): Data Networking Technologies
Degree programme: Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019
Module code: DFMEES-206
Hours per semester week / Teaching method: 4VU (4 hours per week)
ECTS credits: 5
Semester: 2
Mandatory course: yes
Language of instruction: German
Assessment: Project, written exam [*updated 01.07.2021*]
Applicability / Curricular relevance: DFMEES-206 (P610-0140, P610-0148) Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019 , semester 2, mandatory course
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 150 hours (equivalent to 5 ECTS credits). There are therefore 105 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.
Recommended as prerequisite for:
Module coordinator: Prof. Dr.-Ing. Ahmad Osman
Lecturer: Dipl.-Ing. Harald Krauss

[*updated 12.03.2021*]

Learning outcomes:
After successfully completing this module, students will have acquired basic knowledge about the communication between computer-controlled systems. This knowledge will help students understand a wide variety of data networking technologies by adapting the basic systems covered in this lecture.

[*updated 01.07.2021*]

Module content:
Basic communication technology terms, protocols and stacks, direct-connect networks, communication over wide-area networks (transport network technologies, routing).
PC, video projector, scripts

[*updated 01.07.2021*]

Recommended or required reading:
Obermann & Horneffer: Datennetztechnologien, Vieweg+Teubner-Verlag
Werner, Martin: Nachrichtentechnik, Vieweg+Teubner-Verlag,
Meyer, Martin: Kommunikationstechnik, Vieweg+Teubner-Verlag
Badach & Hoffmann: Technik der IP-Netze, Hanser-Verlag
Siegmund, Gerd: Technik der Netze, Hüthig-Verlag
Scherff, Jürgen: Grundkurs Computernetzwerke, Vieweg+Teubner-Verlag

[*updated 01.07.2021*]

Electric Power Supply Systems 1

Module name (EN): Electric Power Supply Systems 1

Degree programme: Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019

Module code: DFMEES-110

Hours per semester week / Teaching method:
3V+1U (4 hours per week)

ECTS credits:
5

Semester: 1

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam, practical exam with composition (2 lab experiments, ungraded)

[*updated 08.01.2020*]

Applicability / Curricular relevance:

DFMEES-110 (P610-0135) Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019 , semester 1, mandatory course, technical
EE1504 (P212-0019, P212-0020) Energy system technology / Renewable energies, Bachelor, ASPO 01.10.2022 , semester 5, mandatory course
E2506 (P211-0077, P211-0078) Electrical Engineering and Information Technology, Bachelor, ASPO 01.10.2018 , semester 5, mandatory course, technical

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Michael Igel

Lecturer: Prof. Dr. Michael Igel

[*updated 16.10.2020*]

Learning outcomes:
After successfully completing this course, students will be able to apply modal transformations to calculate symmetric and asymmetric network states in forward and backward transformations. They will be able to calculate voltages and currents in the symmetrical and asymmetrical normal and short-circuit operation of electrical power supply networks with the aid of symmetrical components. Students will be able to create the equivalent circuit diagram of an electrical power supply network in symmetric components and calculate short-circuit currents and node voltages. They will be able to select equivalent circuits for equipment on a case-by-case basis and parameterize them with nameplate data. They will able to calculate wire nameplate data from the wires´ geometrical and electrical parameters. Students will be able to analyze the design and structure of switchgear and assess the significance and functionality of the components used in it.

[*updated 08.01.2020*]

Module content:
1. Modal transformations: diagonal transformations, symmetric components, 012- and hab-system, physical interpretation 2. Power lines: Structure, transmission tower shapes, overhead line cables, mean geometric distance, ground wire reduction factor, inductors and capacities (symmetrical components), homogeneous transmission line, characteristic impedance and natural power, equivalent circuit diagrams 3. Transformers: Three-winding transformer, zero phase-sequence system 4. Asymmetrical mains operation: Symmetrical and asymmetrical errors, application of symmetrical components, transverse errors, longitudinal errors 5. Switches and switchgear: switch types, switch requirements, switching off in three-phase systems, construction and structure of switchgear, switching in switchgear, current and voltage transformers

[*updated 08.01.2020*]

Teaching methods/Media:
Lectures note as a PDF, projector, program for calculating electrical energy supply networks

[*updated 08.01.2020*]

Recommended or required reading:
Flosdorff, René; Hilgarth, Günther: Elektrische Energieverteilung, Teubner, (latest edition) Happoldt, Hans; Oeding, Dietrich: Elektrische Kraftwerke und Netze, Springer, 1978 Heuck, Klaus; Dettmann, Klaus-Dieter: Elektrische Energieversorgung, Springer Vieweg, (latest edition) Schlabbach, Jürgen: Elektroenergieversorgung, VDE, 2003, 2. Aufl.

[*updated 08.01.2020*]

Electric Power Supply Systems 2

Module name (EN): Electric Power Supply Systems 2

Degree programme: Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019

Module code: DFMEES-210

Hours per semester week / Teaching method:
3V+1U (4 hours per week)

ECTS credits:
4

Semester: 2

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam (50%), practical exam with composition (2 lab experiments, 50%)

[*updated 08.01.2020*]

Applicability / Curricular relevance:

DFMEES-210 (P610-0144) Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019 , semester 2, mandatory course, technical
EE1603 (P212-0021, P212-0022) Energy system technology / Renewable energies, Bachelor, ASPO 01.10.2022 , semester 6, mandatory course
E2606 (P211-0079, P211-0080) Electrical Engineering and Information Technology, Bachelor, ASPO 01.10.2018 , semester 6, mandatory course, technical

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 120 hours (equivalent to 4 ECTS credits).

There are therefore 75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Michael Igel

Lecturer: Prof. Dr. Michael Igel

[*updated 16.10.2020*]

Learning outcomes:
After successfully completing this course, students will be able to recognize the different types of star connections in electric power supply networks, evaluate the advantages and disadvantages of each and select the ideal solution on a case-to-case basis. They will be able to calculate the required equipment. Using the complex alternating current calculation and a network calculation program, they will be able to calculate voltages and currents in normal operation and assess their reliability using the applicable standards and application guidelines. Students will be able to draw up an equivalent circuit diagram of an electrical power supply network in short-circuit operation and calculate short-circuit currents and short-circuit voltages. They will be able to assess the dimensioning of the equipment used in the network. Students will be able to carry out short-circuit current calculations according to the standard or the superposition method. They will be able to compare their calculation results with those of a grid calculation program. They will be able to validate the results of the network calculation program with reference networks.

[*updated 08.01.2020*]

Module content:
1. Star connections: networks with isolated or compensated neutral point, networks with semi-rigid or rigid neutral point earthing, equivalent circuits, calculating with the aid of symmetrical components, compensation coil, degree of detuning, zero-sequence voltage 2. Operating behavior of generators: equivalent circuit diagram, steady state behavior (no-load and short-circuit operation) 3. Calculating dynamic network processes: applying symmetrical components, numerical models of equipment, short-circuit current calculation according to IEC60909, initial short-circuit alternating current, maximum aperiodic short-circuit current, breaking capacity, sustained short-circuit current, equivalent short-circuit current

[*updated 08.01.2020*]

Teaching methods/Media:
Lectures note as a PDF, projector, program for calculating electrical energy supply networks

[*updated 08.01.2020*]

Recommended or required reading:
Flosdorff, René; Hilgarth, Günther: Elektrische Energieverteilung, Teubner, (latest edition) Happoldt, Hans; Oeding, Dietrich: Elektrische Kraftwerke und Netze, Springer, 1978 Heuck, Klaus; Dettmann, Klaus-Dieter: Elektrische Energieversorgung, Springer Vieweg, (latest edition) Schlabbach, Jürgen: Elektroenergieversorgung, VDE, 2003, 2. Aufl.

[*updated 08.01.2020*]

Electromagnetic Compatibility

Module name (EN): Electromagnetic Compatibility

Degree programme: Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019

Module code: DFMEES-106

Hours per semester week / Teaching method:
2VU (2 hours per week)

ECTS credits:
2

Semester: 1

Mandatory course: yes

Language of instruction:
German

Assessment:
Project work

[*updated 01.07.2021*]

Applicability / Curricular relevance:

DFMEES-106 (P610-0130) Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019 , semester 1, mandatory course

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Xiaoying Wang

Lecturer:
Prof. Dr. Xiaoying Wang

[*updated 10.09.2021*]

Learning outcomes:
After successfully completing this module, students will have basic theoretical and practical knowledge of EMC.
They will be familiar with the basic physical and electrical electromagnetic interference (EMI) models and the countermeasures used to prevent EMI in the design phase but also in finished devices.
They will be familiar with the electromagnetic interference simulations used to measure devices and will have initial practical experience with EMC measurements.

They will be familiar with the current European and international legislation and standards in EMC and related areas and will be able to apply them to product design and development.

During their project work, students will gain initial knowledge in their field of specialization and be able to put this knowledge into practice.

This wil allow students to acquire further knowledge in their field of specialization and apply it later in their career.

1.

[*updated 01.07.2021*]

Module content:
Introduction to EMC
2. Description of EMC
3. Signal spectra
4. EMC environment: sources and sinks
5. Coupling methods
6. General EMC countermeasures
7. EMC in the development of devices and installation technology
8. European law, EU directives, product liability and warranties
9. EMC - An overview of measurement methods
10. Biological effects of electromagnetic fields

[*updated 01.07.2021*]

Teaching methods/Media:
Blackboard, overhead projector, video projector, lecture notes

[*updated 01.07.2021*]

Recommended or required reading:
A. Schwab: Elektromagnetische Verträglichkeit, Springer Verlag
E. Habiger: Elektromagnetische Verträglichkeit, Hüthig Verlag
E. Habiger u.a.: Elektromagnetische Verträglichkeit, Verlag Technik, Berlin, München
T. Williams: EMC für Product Designers, B.H. Newnes
R. Perez: Handbook of Electromagnetic Compatibility, Academic Press
H. Meyer, Hrsg.: Elektromagnetische Verträglichkeit von Automatisierungssystemen, VDEVerlag
W. Rudolph: EMV-Fibel für Elektroinstallateure und Planer, VDE-Verlag
W. Rudolph, O. Winter: EMV nach VDE 0100, VDE-Verlag
M. Grapentin: EMV in der Gebäudeinstallation, Verlag Technik
J. Goedbloed: Elektromagnetische Verträglichkeit, Pflaum Verlag
G. Durcansky: EMV - gerechtes Gerätedesign, Franzis Verlag
P. Kodali: Engineering Electromagnetic Compatibility, IEEE Press

C. Paul: Introduction to Electromagnetic Compatibility, Wiley & Sons
P. Chatterton, M.Houlden: EMC, Electromagnetic Theory for Practical Design, Wiley

[*updated 01.07.2021*]

English 1

Module name (EN): English 1

Degree programme: Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019

Module code: DFMEES-103

Hours per semester week / Teaching method:
2VU (2 hours per week)

ECTS credits:
2

Semester: 1

Mandatory course: yes

Language of instruction:
English/German

Assessment:
Written exam (50%) and tests (50%)
Written exam 90 min.

[*updated 08.08.2024*]

Applicability / Curricular relevance:

DFMEES-103 (P610-0128) Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019 , semester 1, mandatory course
DFI-103 (P610-0275) Computer Science, Master, ASPO 01.10.2018 , semester 1, mandatory course
DFMME-103 (P610-0437) Mechanical Engineering, Master, ASPO 01.10.2024 , semester 1, mandatory course

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:
DFMEES-203 English 2

[*updated 28.03.2024*]

Module coordinator:
Dr. Julia Frisch

Lecturer:
Dozierende des Studiengangs

[*updated 28.03.2024*]

Learning outcomes:
After successfully completing this module, students will:
understand adapted topic-related English-language specialist texts and product descriptions from the field of engineering science
have developed and expanded their subject-specific vocabulary and consolidated it through oral and written use
have developed strategies and methods for compiling and summarizing important information in a presentation, an experimental setup or a technical lecture in English

[*updated 08.08.2024*]

Module content:
In coordination with the DFHI Master´s degree programs in Electrical Engineering, Computer Science and European Construction Management, the content is based on common general and technical language requirements. The initial level is B1.
Technical language used in technical standards and instructions
Discussion of topic-related specialist texts from the entire spectrum of the subject
Corporate structure (centralized and decentralized organizations)
Reading, describing, evaluating and creating graphics and tables
Instructions and reports (test protocols, laboratory reports, test reports)
Presentations in a business context (e.g. on software, services, company portfolio)

[*updated 08.08.2024*]

Teaching methods/Media:
The learning content is developed in a communicative and action-oriented manner with targeted listening, reading and speaking exercises in individual, partner and group work. A subject-related presentation on the course content is obligatory.
Short written or oral reviews of learning progress are possible at any time.

[*updated 08.08.2024*]

Recommended or required reading:
Literature and learning materials will be provided during the course

[*updated 08.08.2024*]

English 2

Module name (EN): English 2

Degree programme: Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019

Module code: DFMEES-203

Hours per semester week / Teaching method:
2VU (2 hours per week)

ECTS credits:
2

Semester: 2

Mandatory course: yes

Language of instruction:
English/German

Assessment:
Written exam (50%) and tests (50%)

[*updated 29.04.2024*]

Applicability / Curricular relevance:

DFMEES-203 (P610-0139) Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019 , semester 2, mandatory course
DFI-203 (P610-0283) Computer Science, Master, ASPO 01.10.2018 , semester 2, mandatory course
DFMME-203 (P610-0441) Mechanical Engineering, Master, ASPO 01.10.2024 , semester 2, mandatory course

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
DFMEES-103 English 1

[*updated 28.03.2024*]

Recommended as prerequisite for:

Module coordinator:
Dr. Julia Frisch

Lecturer:
Dozierende des Studiengangs

[*updated 28.03.2024*]

Learning outcomes:
After successfully completing this module, students will be able to:
understand topic-related English-language specialist texts and product descriptions from the field of engineering science and be able to adequately reproduce their content
expand their subject-specific vocabulary as well as their knowledge of situationally appropriate language registers and consolidate both through oral and written practice
explain technical constructions and mechanisms of action using the appropriate language
write their own technical texts such as short reports, descriptions of laboratory experiments and project/product descriptions

[*updated 29.04.2024*]

Module content:
In coordination with the DFHI Master´s degree programs in Electrical Engineering, Computer Science and European Construction Management, the content is based on common general and technical language requirements and expands on the content covered in English 1. The initial level is therefore B1+/B2.
Technical language used in technical standards and instructions
Describing technical systems (on the basis of authentic technical texts, videos, etc.)
Describing cause and effect based on technical systems (language of cause and effect, passive voice)
Composing instructions and reports (test protocols, laboratory reports, test reports)
The changing working world (digitalization)
Presentation techniques and the structure of presentations

[*updated 29.04.2024*]

Teaching methods/Media:
The learning content is developed in a communicative and action-oriented manner with targeted listening, reading and speaking exercises in individual, partner and group work.
Short written or oral reviews of learning progress are possible at any time.

[*updated 29.04.2024*]

Recommended or required reading:

Multimedia-supported teaching and learning material to intensify teaching will be provided in the course and via Moodle.

[*updated 29.04.2024*]

French I

Module name (EN): French I

Degree programme: Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019

Module code: DFMEES-102

Hours per semester week / Teaching method:
4VU (4 hours per week)

ECTS credits:
4

Semester: 1

Mandatory course: yes

Language of instruction:
French

Assessment:
Written exam (50%) + presentation (25%) + tests (25%)

[*updated 08.01.2024*]

Applicability / Curricular relevance:

DFMEES-102 (P610-0127) Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019 , semester 1, mandatory course
DFI-102 (P610-0276) Computer Science, Master, ASPO 01.10.2018 , semester 1, mandatory course
DFMME-102 (P610-0436) Mechanical Engineering, Master, ASPO 01.10.2024 , semester 1, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 120 hours (equivalent to 4 ECTS credits).
There are therefore 75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:
DFMEES-202 French II

[*updated 28.03.2024*]

Module coordinator:
Dr. Julia Frisch

Lecturer:
Dozierende des Studiengangs

[*updated 28.03.2024*]

Learning outcomes:
The module is based on level C1 of the CEFR.
After successfully completing this module, students will:
be able to understand the content of longer, demanding texts on current topics as well as engineering presentations within and outside their subject area and grasp implicit meanings.
have acquired the productive and receptive language skills required for communication in their studies and everyday life.
be able to express themselves in a clear, structured and logically comprehensible manner on current topics from science and society, write a comprehensive written paper on topics from their field of interest or specialization and give a comprehensible lecture/presentation.
be able to apply the central rules of grammar at C1 level.
will be able to implement strategies for autonomous learning in order to make their own learning process more effective and improve their own learning ability.

[*updated 08.01.2024*]

Module content:
Based on reading, audio and video examples on current topics of general social and subject-specific interest and with the help of selected exercises on vocabulary and grammar, students will learn strategies that will enable them to communicate confidently and fluently in the resp. foreign language.

Students:
will become familiar with different types of texts and writing styles,
will practice analyzing, summarizing and critically commenting on complex issues.
will acquire the ability to explain points of view in writing and orally, to grasp nuances of meaning and to deepen the accuracy of expression
Reading, describing, evaluating and creating graphics and tables
Instructions and reports (test protocols, laboratory reports, test reports)
Presentations in a business context (e.g. on software, services, company portfolio)

[*updated 08.01.2024*]

Teaching methods/Media:
The learning content is developed in a communicative and action-oriented manner with targeted listening, reading and speaking exercises in individual, partner and group work.
Students will review and deepen selected aspects of grammar in self-study with given (online) materials (on Moodle).
Multimedia-supported teaching and learning material, also online

[*updated 08.01.2024*]

Recommended or required reading:
Recommended literature and working materials will be announced and made available during the course.

[*updated 08.01.2024*]

French II

Module name (EN): French II

Degree programme: Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019

Module code: DFMEES-202

Hours per semester week / Teaching method:
4VU (4 hours per week)

ECTS credits:
4

Semester: 2

Mandatory course: yes

Language of instruction:
French

Assessment:
Written exam (50%) + presentation (25%) + tests (25%)

[*updated 08.01.2024*]

Applicability / Curricular relevance:

DFMEES-202 (P610-0138) Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019 , semester 2, mandatory course
DFI-202 (P610-0282) Computer Science, Master, ASPO 01.10.2018 , semester 2, mandatory course
DFMME-202 (P610-0440) Mechanical Engineering, Master, ASPO 01.10.2024 , semester 2, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 120 hours (equivalent to 4 ECTS credits).
There are therefore 75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
DFMEES-102 French I

[*updated 28.03.2024*]

Recommended as prerequisite for:

Module coordinator:
Dr. Julia Frisch

Lecturer:
Dozierende des Studiengangs

[*updated 28.03.2024*]

Learning outcomes:
The module is based on level C1 of the CEFR.
After successfully completing this module, students will:
- be able to understand more complex texts, such as scientific articles or technical literature, in French in detail and analyze them adequately,
- be able to use the relevant specialist terminology from the subject area in French in a form relevant to communication,
and competently develop communication strategies for demanding professional situations in international management and apply them accordingly,
- be able to give academic presentations in French and conduct academic discussions in the foreign language while competently representing their points of view,
- be able to negotiate and hold technical discussions in French without any problems and communicate in the same way in general,
and write complex written reports in French in an appropriate form.

[*updated 08.01.2024*]

Module content:
Listening comprehension, reading comprehension, speaking, writing (work-related writing)
In addition, for example.: Professional problem solving strategies (national and international)
Presentations (work-related topics)
Grammar
Vocabulary (focus on technical terms)
Problem solving strategies for professional situations
Technical language used in technical standards and instructions
Describing technical systems (on the basis of authentic technical texts, videos, etc.)

[*updated 08.01.2024*]

Teaching methods/Media:
The learning content is developed in a communicative and action-oriented manner with targeted listening, reading and speaking exercises in individual, partner and group work.
Students will review and deepen selected aspects of grammar in self-study with given (online) materials (on Moodle).
Multimedia-supported teaching and learning material, also online

[*updated 08.01.2024*]

Recommended or required reading:
Recommended literature and working materials will be announced and made available during the course.

[*updated 08.01.2024*]

German 1

Module name (EN): German 1

Degree programme: Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019

Module code: DFMEES-101

Hours per semester week / Teaching method:
4VU (4 hours per week)

ECTS credits:
4

Semester: 1

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam (50%) and tests (50%)
Written exam 90 min.

[*updated 08.08.2024*]

Applicability / Curricular relevance:

DFMEES-101 (P610-0126) Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019 , semester 1, mandatory course
DFI-101 (P610-0274) Computer Science, Master, ASPO 01.10.2018 , semester 1, mandatory course
DFMME-101 (P610-0435) Mechanical Engineering, Master, ASPO 01.10.2024 , semester 1, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 120 hours (equivalent to 4 ECTS credits).
There are therefore 75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:
DFMEES-201 German 2

[*updated 28.03.2024*]

Module coordinator:
Dr. Julia Frisch

Lecturer:
Dozierende des Studiengangs

[*updated 28.03.2024*]

Learning outcomes:
The module is based on level C1 of the CEFR.

After successfully completing this module, students will:

be able to understand the content of longer, demanding texts on current topics as well as engineering presentations within and outside their subject area and grasp implicit meanings.

have acquired the productive and receptive language skills required for communication in their studies and everyday life.

be able to express themselves in a clear, structured and logically comprehensible manner on current topics from science and society, write a comprehensive written paper on topics from their field of interest or specialization and give a comprehensible lecture/presentation.

be able to apply the central rules of grammar at C1 level.

will be able to implement strategies for autonomous learning in order to make their own learning process more effective and improve their own learning ability.

[*updated 08.08.2024*]

Module content:

In this module, students will develop their knowledge of German as a foreign language at an advanced written language level, taking into account subject-related and intercultural aspects.

Based on reading, audio and video examples on current topics of general social and subject-specific interest and with the help of selected exercises on vocabulary and grammar, students will learn strategies that will enable them to communicate confidently and fluently in the resp. foreign language.

After successfully completing this module, students will:

have become familiar with different types of texts and writing styles,

have practiced analyzing, summarizing and critically commenting on complex issues.

have acquired the ability to explain points of view in writing and orally, to grasp nuances of meaning and to deepen the accuracy of expression

have learned selected grammatical structures such as prepositional phrases, participial constructions, noun-verb-conjunctions, passive and passive substitutes, nominalization-verbalization, connectors, modal particles and genitive attributes.

[*updated 08.08.2024*]

Teaching methods/Media:

The learning content is developed in a communicative and action-oriented manner with targeted listening, reading and speaking exercises in individual, partner and group work.

Students will review and deepen selected aspects of grammar in self-study with given (online) materials (on Moodle).

Multimedia-supported teaching and learning material, also online

[*updated 08.08.2024*]

Recommended or required reading:

Recommended literature and working materials will be announced and made available during the course.

[*updated 08.08.2024*]

German 2

Module name (EN): German 2

Degree programme: Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019

Module code: DFMEES-201

Hours per semester week / Teaching method:
4VU (4 hours per week)

ECTS credits:
4

Semester: 2

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam (50%) and tests (50%)
Written exam 90 min.

[*updated 08.08.2024*]

Applicability / Curricular relevance:

DFMEES-201 (P610-0137) Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019 , semester 2, mandatory course
DFI-201 (P610-0281) Computer Science, Master, ASPO 01.10.2018 , semester 2, mandatory course
DFMME-201 (P610-0439) Mechanical Engineering, Master, ASPO 01.10.2024 , semester 2, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 120 hours (equivalent to 4 ECTS credits).
There are therefore 75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
DFMEES-101 German 1

[*updated 28.03.2024*]

Recommended as prerequisite for:

Module coordinator:
Dr. Julia Frisch

Lecturer:
Dozierende des Studiengangs

[*updated 28.03.2024*]

Learning outcomes:
The module is based on level C1 of the CEFR.
After successfully completing this module, students will:
be able to understand the content of longer, demanding texts on current topics as well as engineering presentations within and outside their subject area and grasp implicit meanings.
have acquired the productive and receptive language skills required for communication in their studies and everyday life.
be able to express themselves in a clear, structured and logically comprehensible manner on current topics from science and society, write a comprehensive written paper on topics from their field of interest or specialization and give a comprehensible lecture/presentation.
be able to apply the central rules of grammar at C1 level.
will be able to implement strategies for autonomous learning in order to make their own learning process more effective and improve their own learning ability.

[*updated 08.08.2024*]

Module content:
In this module, students will develop their knowledge of German as a foreign language at an advanced written language level, taking into account subject-related and intercultural aspects.

Based on reading, audio and video examples of current topics of general and subject-specific interest, as well as with the help of selected exercises on vocabulary and grammar, students will review and deepen the strategies that enable them to communicate confidently and fluently in the foreign language.

After successfully completing this module, students will:
be able to review and deepen their knowledge of different types of texts and writing styles,
have expanded their ability to analyze, summarize and critically comment on complex issues, to grasp nuances of meaning and to deepen the accuracy of expression.
have improved their knowledge of selected grammatical structures.

[*updated 08.08.2024*]

Teaching methods/Media:
The learning content is developed in a communicative and action-oriented manner with targeted listening, reading and speaking exercises in individual, partner and group work.
Students will review and deepen selected aspects of grammar in self-study with given (online) materials (on Moodle).
Multimedia-supported teaching and learning material, also online

[*updated 08.08.2024*]

Recommended or required reading:
Recommended literature and working materials will be announced and made available during the course.

[*updated 08.08.2024*]

Intercultural Management 1

Module name (EN): Intercultural Management 1

Degree programme: Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019

Module code: DFMEES-104

Hours per semester week / Teaching method:
2VU (2 hours per week)

ECTS credits:
2

Semester: 1

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam and oral presentation (each 50%)

[*updated 15.04.2024*]

Applicability / Curricular relevance:

DFMEES-104 (P610-0129) Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019 , semester 1, mandatory course
DFI-104 (P610-0277) Computer Science, Master, ASPO 01.10.2018 , semester 1, mandatory course
DFMME-104 (P610-0438) Mechanical Engineering, Master, ASPO 01.10.2024 , semester 1, mandatory course

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:
DFMEES-204 Intercultural Management 2

[*updated 28.03.2024*]

Module coordinator:
Dr. Julia Frisch

Lecturer:
Maha Tischer, Diplômée de Maîtrise

[*updated 28.03.2024*]

Learning outcomes:
After successfully completing this module, students will be able to:
recognize communicative and (work) cultural causes for problems in intercultural situations
reflect on their own cultural imprint, especially with regard to communication behavior and (work) behavior in teams
develop solution strategies for challenges in multicultural work contexts
understand the work-cultural and communicative characteristics of the Arab world and can compare these to their own expectations of communication and work situations

[*updated 15.04.2024*]

Module content:
Consolidation of basic concepts and models from the subject areas of culture, communication and perception of others (alignment of students´ previous knowledge)
Conflict behavior and solution strategies in an intercultural work context (teamwork, hierarchies, understanding work and roles, metacommunication)
Cultural (self-)awareness as a key competence
Case studies and practical exercises
Non-European focus: the Arab world

[*updated 15.04.2024*]

Teaching methods/Media:
Lecturer presentations
(Interactive) exercises and case studies
Group work
Digital content via moodle

[*updated 15.04.2024*]

Recommended or required reading:
Will be announced in the course
Multimedia-supported teaching and learning material to intensify teaching will be provided in the course and via Moodle.

[*updated 15.04.2024*]

Intercultural Management 2

Module name (EN): Intercultural Management 2

Degree programme: Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019

Module code: DFMEES-204

Hours per semester week / Teaching method:
2VU (2 hours per week)

ECTS credits:
2

Semester: 2

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam and oral presentation (each 50%)

[*updated 15.04.2024*]

Applicability / Curricular relevance:

DFMEES-204 (P610-0096) Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019 , semester 2, mandatory course
DFI-204 (P610-0284) Computer Science, Master, ASPO 01.10.2018 , semester 2, mandatory course
DFMME-204 (P610-0442) Mechanical Engineering, Master, ASPO 01.10.2024 , semester 2, mandatory course

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
DFMEES-104 Intercultural Management 1

[*updated 28.03.2024*]

Recommended as prerequisite for:

Module coordinator:
Dr. Julia Frisch

Lecturer:
Dozierende des Studiengangs

[*updated 28.03.2024*]

Learning outcomes:
After successfully completing this module, students will be able to:

weigh up different models of intercultural competence(s) against each other
explain strategies for acquiring intercultural competence(s)
work on smaller intercultural training units as part of a simulation/management game
discuss the Euro/US-centric perspective of various common studies and models in the field of intercultural business communication

[*updated 15.04.2024*]

Module content:

Constructive intercultural management
Intercultural learning and intercultural forms of training
Change of perspective: working with multicultural colleagues and team members in the company or within their own projects
Opportunities, limits and risks of comparative cultural models in everyday working life
Case studies and practical exercises
Possible focuses: Europe outside of Germany and France, USA

[*updated 15.04.2024*]

Teaching methods/Media:

Lecturer presentations
(Interactive) exercises and case studies
Group work
Digital content via moodle

[*updated 15.04.2024*]

Recommended or required reading:

Will be announced in the course
Multimedia-supported teaching and learning material to intensify teaching will be provided in the course and via Moodle.

[*updated 15.04.2024*]

Methods and Applications of Machine Vision

Module name (EN): Methods and Applications of Machine Vision

Degree programme: Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019

Module code: DFMEES-109

Hours per semester week / Teaching method:
4VU (4 hours per week)

ECTS credits:
5

Semester: 1

Mandatory course: yes

Language of instruction:
German

Assessment:
Exam

[*updated 09.11.2022*]

Applicability / Curricular relevance:

DFMEES-109 (P610-0134) Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019 , semester 1, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Marc Quirin, M.Sc.

Lecturer:
Marc Quirin, M.Sc.

[*updated 23.09.2022*]

Learning outcomes:
After successfully completing this module, students will be familiar with the practical methods and applications in industrial image processing. More specifically, students be familair with basic methods and algorithms in image processing. Students will be able to systematically plan and implement an image processing task, both in the design of the hardware and software. The programming exercises in this module will emphasize the theoretical principles taught in the “front-end” and “back-end” of the image processing chain.

[*updated 09.11.2022*]

Module content:
Module content:
1. Introduction to the stages of machine vision
1.1. Selection criteria for an image processing system
1.2. Possible computations
1.3. Image processing chain
2. Technical basics for the “front-end” of the image processing chain
2.1. Lighting
2.2. Filters
2.3. Lenses
2.4. Basics of camera technology
2.5. Transmitting image information to the computer
2.6. Image artifacts

2.6.1. Aliasing
2.6.2. Image noise
3. The “back-end” of the image processing chain
3.1. Mathematical tools
3.2. Camera model and camera calibration
3.3. Color models
3.4. Image representation
3.5. Image preprocessing in spatial and frequency domain
3.6. Morphological operators
3.7. Segmentation
3.8. Labeling
3.9. Feature extraction
3.10 Classification
4. Summary

[*updated 09.11.2022*]

Teaching methods/Media:
Blackboard, lecture notes, Matlab, LabVIEW, Python

[*updated 09.11.2022*]

Recommended or required reading:
Tönnies Klaus D.: Grundlagen der Bildverarbeitung, Addison-Wesley Verlag, 2005
Jähne B.: Digitale Bildverarbeitung. Springer, 5. Edition, 2002
Haberäcker Peter: Digitale Bildverarbeitung, Carl Hanser Verlag München Wien, 1987

[*updated 09.11.2022*]

Power Electronics and Drive Systems Engineering

Module name (EN): Power Electronics and Drive Systems Engineering

Degree programme: Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019

Module code: DFMEES-107

Hours per semester week / Teaching method:
2V+1U+1P (4 hours per week)

ECTS credits:
5

Semester: 1

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam, practical exam with composition (3 lab experiments, ungraded)

[*updated 08.01.2020*]

Applicability / Curricular relevance:

DFMEES-107 (P610-0132) Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019 , semester 1, mandatory course, technical
EE1501 (P212-0048, P212-0049) Energy system technology / Renewable energies, Bachelor, ASPO 01.10.2022 , semester 5, mandatory course
E2505 (P211-0105, P211-0106) Electrical Engineering and Information Technology, Bachelor, ASPO 01.10.2018 , semester 5, mandatory course, technical

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Stefan Winternheimer

Lecturer: Prof. Dr.-Ing. Stefan Winternheimer

[*updated 16.10.2020*]

Learning outcomes:
After successfully completing this course, students will have acquired basic knowledge about electrical drive technology and the power electronics required for it. They will be able to distinguish between different electric drives and identify their areas of application.

[*updated 08.01.2020*]

Module content:
1 DC drives 1.1 Direct current machines: basic design and operating characteristics 1.2 DC chopper converter: buck converter, boost converter, two- and four-quadrant chopper 2 Three-phase drives 2.1 Asynchronous machines: basic design and operating characteristics 2.2 Synchronous machines: basic design and operating characteristics 3. Analysis of actuating and motion processes 3.1 Quantities of the motion cycle 3.2 Forces and torques 3.3 Mechanical drive power 3.4 Power requirements of selected machines 4. Lab 4.1 AC power controller 4.2 Three-phase bridge connection 4.3 DC machine

[*updated 08.01.2020*]

Teaching methods/Media:
Transparencies, blackboard, lecture notes and electronic handouts

[*updated 08.01.2020*]

Recommended or required reading:
Fischer, Rolf: Elektrische Maschinen, Hanser, (latest edition) Mohan, Ned; Undeland, Tore M.; Robbins, William P.: Power Electronics, Wiley, (latest edition) Seefried, Eberhard: Elektrische Maschinen und Antriebstechnik, Vieweg, Braunschweig/Wiesbaden, 2001 Vogel, Johannes: Elektrische Antriebstechnik, Hüthig, Heidelberg, 1989, 4. Aufl.

[*updated 08.01.2020*]

Principles and Application of Non-Destructive Testing Methods for Quality Assurance and Component Testing

Module name (EN): Principles and Application of Non-Destructive Testing Methods for Quality Assurance and Component Testing

Degree programme: Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019

Module code: DFMEES-214

Hours per semester week / Teaching method:
2VU (2 hours per week)

ECTS credits:
3

Semester: 2

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam (80%) and laboratory exercise with a short paper (20%).

[*updated 09.11.2022*]

Applicability / Curricular relevance:

DFMEES-214 (P610-0572) Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019 , semester 2, mandatory course

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 90 hours (equivalent to 3 ECTS credits).
There are therefore 67.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Ahmad Osman

Lecturer:
Marc Quirin, M.Sc.

[*updated 29.09.2022*]

Learning outcomes:
After successfully completing this module, students will be familiar with the fundamentals of non-destructive materials testing. Students will be familiar with the most commonly used procedures in NDT,
both theoretically and practically. In addition students will:
be able to apply the methods they have learned in practice.

[*updated 09.11.2022*]

Module content:
1. Introduction to NDT
2. Ultrasonic testing
2.1. Introduction
2.2. Physical principles
2.3. Probe design, sound field and instrumentation
2.4. Principles of angle beam scanning
2.5. Phased array probes
2.6. Error control
2.7. Summary
3. Eddy current testing
3.1. Introduction
3.2. Physical principles
3.3. Basics of eddy current testing
3.4. Properties of eddy currents
3.5. Device design and functions
3.6. Summary
4. Infrared testing
4.1. Introduction
4.2. Physical principles
4.3. Radiation Physics
4.4. Interaction of electromagnetic radiation with matter
4.5. Active infrared thermography
4.6. Summary
5. Magnetic particle testing
5.1. Introduction
5.2. Physical principles
5.3. Physical metrology
5.4. Detection and application limits
5.5. Error check/flux leakage test
5.6. Applications
5.7. Test equipment and instrumentation
6. Lab tests for the procedures
6.1. Ultrasonic testing
6.2. Eddy current testing
6.3. Thermography
7. Conclusion

[*updated 09.11.2022*]

Teaching methods/Media:
Interactive lecture with written exam and practical exercises, as well as lab work in small groups with tests.
Transparencies with animations, schematic and real images.

[*updated 09.11.2022*]

Recommended or required reading:
Prof. Dr. Ing. Bernd Valeske / Vorlesungsskript zfP1
Hochschule für Technik und Wirtschaft des Saarlandes, Campus Alt-Saarbrücken
V. Deutsch: ZfP kompakt und verständlich
Castell-Verlag (Wuppertal), Informationsreihe, Bände 0 bis 12, ab Jahrgang 2002
J. Krautkrämer & K. Krautkrämer
Zerstörungsfreie Werkstoffprüfung mit Ultraschall
Springer Verlag, 5. Auflage, 1986
Xavier P.V. Maldague
Theory and Practice of Infrared Technology for Nondestructive Testing
Wiley-Interscience, 2001

[*updated 09.11.2022*]

Process Automation

Module name (EN): Process Automation

Degree programme: Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019

Module code: DFMEES-108

Hours per semester week / Teaching method:
4PA (4 hours per week)

ECTS credits:
4

Semester: 1

Mandatory course: yes

Language of instruction:
German

Assessment:
Seminar presentation

[*updated 08.01.2020*]

Applicability / Curricular relevance:

DFMEES-108 (P610-0133) Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019 , semester 1, mandatory course, technical
E2503 (P211-0024) Electrical Engineering and Information Technology, Bachelor, ASPO 01.10.2018 , semester 5, mandatory course, technical

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 120 hours (equivalent to 4 ECTS credits).
There are therefore 75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Benedikt Faupel

Lecturer: Prof. Dr. Benedikt Faupel

[*updated 16.10.2020*]

Learning outcomes:
Within the framework of project work, solution strategies, suitable automation systems, tools and simulation tools for process automation problems will be specifically selected and prototypically implemented. Students will create their own solutions for sub-tasks that typically occur in the course of industrial automation projects. They will prepare and present their solutions didactically.

[*updated 08.01.2020*]

Module content:
1. Standards and guidelines for automation technology 2. Process identification methods 2.1. Analysis methods for identifying analog LTI systems 2.2. Least-squares method for identification of discrete LTI systems 3. Processing sensors/actuators in automation technology 3.1. Interfacing/information processing of sensors and actuators 3.2. Analog value processing with SPS (standardization) 3.3. How actuators function and operate 4. Automating sequence controls 4.1. Sequential function chart in control technology according to IEC 1131 4.2. Structure and function of recipe control 4.3. Realization of sequential programs for PLC with step chain programming and S7-Graph 5. Communication systems in automation technology 5.1. Serial communication 5.2. ISO/OSI layer model of communication 5.3. Fieldbus systems (Profibus, ProfiNet, ASI) 5.4. Networking PLC systems 6. Implementation of controllers on SPS 6.1. Designing control functions (two-point, three-point, PID controller) at function block level 6.2. Adaptation / integration of controller function blocks in practical applications

[*updated 08.01.2020*]

Teaching methods/Media:
Presentation, lab equipment, control engineering/process automation lab

[*updated 08.01.2020*]

Recommended or required reading:
Berger, Hans: Automatisieren mit SIMATIC S7-1500, Publicis MCD, 2017, 2. Aufl., ISBN 978-3-8957-8451-4 Grupp Frieder; Grupp Florian: MATLAB für Ingenieure, Oldenbourg, München, (latest

edition) Schneider, Ekkehard: Methoden der Automatisierung, Vieweg, Braunschweig, 1999, ISBN 978-3528065669 Seitz, Matthias: Speicherprogrammierbare Steuerungen für die Fabrik- und Prozessautomation, Hanser, (latest edition) Wellenreuther, Günter; Zastrow, Dieter: Automatisieren mit SPS - Theorie und Praxis, Vieweg, Wiesbaden, (latest edition) Wellenreuther, Günter; Zastrow, Dieter: Automatisieren mit SPS - Übersichten und Übungsaufgaben, Vieweg, Wiesbaden, (latest edition)

[*updated 08.01.2020*]

Software Development with C/C++

Module name (EN): Software Development with C/C++

Degree programme: Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019

Module code: DFMEES-205

Hours per semester week / Teaching method:
2V+2U (4 hours per week)

ECTS credits:
5

Semester: 2

Mandatory course: yes

Language of instruction:
German

Assessment:
Project work

[*updated 22.05.2023*]

Applicability / Curricular relevance:

DFMEES-205 (P610-0146, P610-0151) Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019 , semester 2, mandatory course, technical
E2805 (P211-0163) Electrical Engineering and Information Technology, Master, ASPO 01.04.2019 , semester 1, mandatory course, technical

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Reinhard Brocks

Lecturer: Prof. Dr. Reinhard Brocks

[*updated 16.10.2020*]

Learning outcomes:
After successfully completing this module, students will be able to create and use C/C++ libraries. They will be able to use design techniques and development tools for software development. Within the framework of a small project, students will learn to plan projects, coordinate tasks with others, explore new areas of knowledge independently and present their work results.

[*updated 22.05.2023*]

Module content:
* Development tools: integrated development environment, version management
* Interfaces: static/dynamic library/API programming, framework
* Design techniques: UML state diagrams, UML class diagrams, UML sequence diagrams, decision tables
* Object-oriented programming, parallel programming
* Design patterns: Wrapper, inversion of control, state pattern,
* Software engineering: Requirements analysis

Areas of application include data transmission, serialization/ rotocol development, Arduino, GUI programming, file processing, interprocess communication, software testing.

[*updated 22.05.2023*]

Teaching methods/Media:
Lecture notes

[*updated 22.05.2023*]

Recommended or required reading:
Breymann, Ulrich: Die C++ Standard Template Library, Addison-Wesley, 1996, ISBN 3-8273-1067-9
Dausmann, Manfred: C als erste Programmiersprache, Springer Vieweg, (akt. Aufl.)
Erlenkötter, Helmut: C++: Objektorientiertes Programmieren von Anfang an, rororo, (akt. Aufl.)
Kernighan, Brian W.; Ritchie, Dennis M.: Programmieren in C, Hanser, 1990, 2. Ausg. ANSI C
Stroustrup, Bjarne: Die C++ Programmiersprache, Addison-Wesley, (akt. Aufl.)
Wolf, Jürgen: C von A bis Z, Galileo Press, Bonn, 2009, 2. Aufl., ISBN 978-3-8362-1429-2

[*updated 22.05.2023*]

The Electric Power Industry

Module name (EN): The Electric Power Industry

Degree programme: Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019

Module code: DFMEES-111

Hours per semester week / Teaching method:

2V (2 hours per week)

ECTS credits:
2

Semester: 1

Mandatory course: yes

Language of instruction:
German

Assessment:
Written or oral exam

[*updated 23.11.2020*]

Applicability / Curricular relevance:

DFMEES-111 Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019 , semester 1, mandatory course, non-technical
E1550 (P211-0008) Electrical Engineering, Bachelor, ASPO 01.10.2012 , optional course, non-technical
EE-K2-513 (P211-0008) Energy system technology / Renewable energies, Bachelor, ASPO 01.10.2012 , semester 5, optional course, engineering
EE-K2-513 (P211-0008) Energy system technology / Renewable energies, Bachelor, ASPO 01.04.2015 , semester 5, optional course, engineering
E2532 (P211-0008) Electrical Engineering and Information Technology, Bachelor, ASPO 01.10.2018 , optional course, non-technical

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Michael Igel

Lecturer: Prof. Dr. Michael Igel

[*updated 16.10.2020*]

Learning outcomes:
After successfully completing this course, students will be familiar with the fundamentals of the field, as well as the energy industry and the associated combination of technology and economics.
In addition, students will be able to:
- describe the entire chain of energy supply from the production, conversion, transmission and distribution to the supply of electrical energy and natural gas to the consumer
- explain technological-economic interrelationships and acknowledge them from the perspective of energy

law
- explain the structure of the German energy market and the terms used in the energy industry
- calculate individual electricity supply contracts and demonstrate the importance of risk management for the energy industry

[*updated 23.11.2020*]

Module content:
1. Primary energy market
2. Procuring grid-bound energy
3. Energy law framework
4. Transmission and distribution of energy
5. Price factors and price systems in the energy industry

[*updated 23.11.2020*]

Recommended or required reading:
Konstantin: Praxisbuch Energiewirtschaft
Schiffer: Energiemarkt Deutschland
Dittmann; Gnüchtel; Stamer; u.a.: Energiewirtschaft
VDEW: Energierecht, Ergänzungsband zur EnWG-Novelle

[*updated 23.11.2020*]

Electrical Engineering - Renewable Energy and System Technology Master - optional courses