Examination Regulations for REMENA Master Program

Status: 26.06.2018

Examination Regulations for the German-Arab Advanced Professional Master's Course in Renewable Energy and Energy Efficiency for the Middle East and North Africa (MENA) Region at the Electrical Engineering/Computer Science Department of the University of Kassel in cooperation with the Faculty of Engineering Cairo University and the Energy Engineering Department of the National Engineering School of Monastir, University of Monastir (UM), dated 26.06.2018.

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I. Common Provisions

§ 1 Scope

The Examination Regulations of the Faculty of Electrical Engineering/Computer Science of the University of Kassel (UKAS) for the Advanced Training German-Arab Master's Course of Study in "Renewable Energy and Energy Efficiency for the Middle East and North Africa (MENA) Region" (REMENA) supplement the General Provisions for Subject Area Examination Rules for Degrees at the Bachelor's and Master's Level at the University of Kassel (AB Bachelor/Master) within the respective valid version.

§ 2 Academic Degree, Type of Profile

(1) The Master's Examination concludes the English language advanced professional course of REMANA study.

(2) Based on the passed Master's Examination the Department of Electrical Engineering/Computer Science awards the academic degree "Master of Science". As part of a "Double Degree Program", the degree is only valid with a corresponding degree from Cairo University (CU), Egypt, or University Monastir (UM), Tunisia. The degree is obtained from the universities in which the study is accomplished during the first two consecutive semesters.

(3) The type of profile of the Master's course of study is conceived as more practice-oriented.

(4) For master program enrolment, the student has to pay study fees determined by the president of UKAS.

§ 3 Standard Duration of Studies, Start of Studies and Credits

(1) The standard duration of studies is 24 months including the Master's thesis. The 24 months comprise either two summer semesters and one winter semester or two winter semesters and one summer semester in addition to 6 months for the Master's thesis

(2) Start of studies in either winter- or summer semester is possible. Start of studies for summer semester can be effected in UKAS. Start of studies for winter semester can be effected in either CU or UM. The possible study Plans are given in Appendix A.

(3) The Master's thesis comprises 30 credits. The remaining modules comprise a minimum of 90 credits. Specifications are given in § 7.

§ 4 Board of Examiners

(1) The competent body for decisions in exam-related issues is the examination committee for Renewable Energy and Energy Efficiency for the MENA Region.

(2) The examination committee is formed by representatives of the involved specialities of the department of Electrical Engineering/Computer Science of UKAS. The members of the examination committee are:

- Three professors of the department Electrical Engineering/Computer Science

- One academic employee
- One student member of the Master's course.

(3) The professors, the academic employee as well as the student member are elected by the departmental council.

II. Master's Examination

§ 5 Module examinations

(1) Feasible exam performances are presentations, written and oral exams, discussion contributions, as well as reports and written assignments.

(2) The study-accompanying module examinations may consist of several module partial examinations. The module examination is passed if all partial module examinations have been passed with at least "sufficient" (4.0).

(3) A module examination is passed if the overall grade of the module is rated with at least sufficient. Failed module examinations can be repeated twice. For the module examination consisting of several partial module examinations, individual partial module examinations evaluated with "insufficient" (greater than 4.0) can be repeated twice. A repetition of passed module examinations is not permitted.

(4) Repeat exam can be taken at the time when the next exam is offered. For the reasonable and difficult cases, the possibility to repeat the exam is agreed individually. The examination board announces the dates for re-examinations.

§ 6 Admission Prerequisites to Master's Studies

(1) Eligible for being admitted to Master's studies is who

1. has completed a Bachelor's or Diploma or equivalent course of studies with a regular period of study of at least 6 semesters at a University or University of Applied Sciences in the Federal Republic of Germany, or an equivalent University abroad in the subject areas Mathematics, Sciences, Engineering, or in Computer Science with a minimal overall grade "Good" (2.5), or an equivalent international grade mark, or
2. has completed a Bachelor's or Diploma or equivalent course of studies with a regular period of study of at least 6 semesters at a University or University of Applied Sciences in the Federal Republic of Germany, or an equivalent University abroad in the subject areas law, economics, or social sciences with a minimal overall grade "Good" (2.5), or an equivalent international grade mark, and can proof 10 credits in the subject area Mathematics, Sciences- and Engineering, or Computer Sciences, and
3. presents a motivation letter and two reference letters.

The examination board may take deviating decisions from the minimal overall grade of "good" according to section 1.1 and 1. 2, if the applicant's profile is proven to have above the average course achievements in the previous course of studies.

(2) Applicants should additionally submit a proof of having at least one year of work experience in a field relevant to the course of study. Included in the relevant areas are i.a. activities in industrial enterprises, services or institutions in the field of solar technology and photovoltaics, wind power, geothermal, hydro power, bioenergy, electrical engineering, mechanical engineering, computer science, natural sciences and mathematics, as well as

environmentally compatible building. In well-founded exceptional cases the examination board may admit applicants with less work-experience.

(3) Based on a written application, it is usually determined if the prerequisites according to (1) are fulfilled. In cases of doubt, an interview of approximately 30 minutes can be conducted, for which two examiners from the examination board are selected.

(4) Furthermore, evidence of sufficient knowledge of the English language with level B2 according to the Common European Framework of Reference for Languages CEFR must be presented. This evidence is granted for the applicant if the mother tongue is English or if the previous studies were completely conducted in English.

§ 7 Examination Components of Master's Degree

(1) The Master's study consists of the Master's thesis including the Master's colloquium according to § 8 with 30 credits and module examinations of a minimum of 90 credits. 32 credits out of 90 are to be obtained from compulsory modules while at least 58 credits are from elective modules.

(2) The offered modules consist of basic modules conducted at UKAS, CU and UM, elective modules conducted at UKAS, CU and UM as well as the master thesis module. In addition, there are master modules offered by the universities participating in the REMENA network. These modules are equivalent to the elective modules given at UKAS, CU and UM.

(3) The basic modules in the first two semesters are compulsory modules.

(4) The basic modules at UKAS are:

- Engineering Basics 10 Credits
- Intercultural Competencies 6 Credits

The basic modules at CU are:

- Thermodynamic Basics 10 Credits
- Language and Presentation 6 Credits

The basic modules at UM are:

- Energy and Thermodynamics Basics 10 Credits
- Language and Communication Competencies 6 Credits

(5) The elective modules at UKAS are:

- Practical Aspects of Renewable Energies and Energy Efficiency 7 Credits
- Economic Activities of Germany in the MENA Region 4 Credits
- Project Management 5 Credits
- Solar Energy Systems 6 Credits
- Wind Energy Technology 6 Credits
- Energy Efficiency and Storage 8 Credits
- Renewable Energy Integration 7 Credits
- Scientific Programming and Publishing 6 Credits

The elective modules at CU are:

- Fundamentals of Renewable Energies and Energy Efficiency 7 Credits

- Economic and Ecological Aspects of Renewable Energies and Energy Efficiency 8 Credits
- Solar Energy Devices 6 Credits
- Bio Energy 4 Credits
- Development of Renewable Energy Projects 5 Credits

The elective modules at UM are:

- Advanced Energy Engineering 6 Credits
- Energy and Environment 4 Credits
- Management and Engineering Mathematics 5 Credits
- Solar Energy Subsystems 5 Credits
- Geothermal Energy 5 Credits
- Combined Cooling, Heating and Power (CCHP) 5 Credits

(6) UKAS, CU and UM offered the compulsory module of the Thesis Project with total of 30 Credits.

§ 8 Master's Thesis and Colloquium

(1) The master's thesis and the colloquium form the master's degree module. 30 credits will be obtained for the master's degree module.

(2) The topic of the Master's thesis (module *thesis project*) can be defined and registered if the student has passed the exams with at least 84 credits acc. to § 7. Defining the thesis topic and determining the thesis supervisors can be done by the examination board or the student has a right to propose the topic and the supervisors.

(3) The duration of the master's thesis after finalizing the third semester is six months from the registration date in which the topic is announced. The Master's thesis topic must be such that it can be worked out within the scheduled period (six months). The topic of the Master's thesis can be changed only once and within the first month.

(4) If the first deadline for submission cannot be met due to reasons for which the candidate cannot be held responsible, the examination committee can grant a one-time extension for a maximum of three months given that the candidate applies before the first submission date and the supervisor agrees.

(5) The Master's thesis will be submitted within the prescribed period in two printed stapled copies and one electronic version to the examination committee.

(6) The master thesis is to be presented and defended in the context of a master colloquium. The master's colloquium usually takes place within one month after submission of the master's thesis. In addition to the candidate, the examiners nominated by the participating universities participate in the colloquium. The defense duration is 30 to a maximum of 50 minutes. The defense date of the master's colloquium will be announced by the examination board by at least two weeks in advance. If the colloquium is not passed, the examination board will define a date for defending again within a period of one month after the first colloquium date. Participating in the master's colloquium requires that the Master's thesis has been rated at least "sufficient" (4.0).

§ 9 Assessment of Examination Performance, Calculation and Weighting of Grades

(1) The overall mark of a module is calculated as arithmetical average of marks weighted from the credits of marks of courses included in the module.

(2) The overall mark of the Master's examination is calculated as credits-weighted arithmetic average from the marks of the modular examinations acc. to § 7.

(3) The mark of all modules according to § 7 are converted to the German grading scale according to Annex D.

III. Concluding Provisions

§ 10 Coming into Effect

These exam regulations will come into effect on the day after announcement in the bulletin of the University of Kassel.

Kassel, den XXX

Dean of the Electrical Engineering/Computer Science Department

Prof. Dr.-Ing. Axel Bangert

Annex A: Sample Study Plan

REMENA master program offers three main types of modules:

- Basic Modules
- Elective Modules
- Thesis Project Module (Master Thesis)

The study can be taken in the winter semester (WiSe) or in the summer semester (SuSe), resulting in six different modes of master curricula, which are shown in Table 1-Table 6. The universities awarding the respective double degree are those in which the first two semesters are attended. Thus, the double degree Kassel-Cairo (DDKC) results in Table 1, while in the case of the study of mode 2 according to Table 2 the double degree Kassel-Monastir (DDKM) is awarded.

Mode "1": starting in the winter semester (WiSe)								
Semester	WiSe/SuSe	Site	ECTS				ECTS per Semester	Type of Double-Degree
			16	14	30	30		
1	WiSe	Cairo	Basic	Elective	-		30	DDKC
2	SuSe	Kassel	Basic	Elective	-		30	
3	WiSe	Monastir	-		Elective	-	30	
4	SuSe	MENA-Region/Germany	-			Thesis	30	

Table 1: Study plan of Mode "1" for double-degree DDKC starting in WiSe.

Mode "2": starting in the winter semester (WiSe)								
Semester	WiSe/SuSe	Site	ECTS				ECTS per Semester	Type of Double-Degree
			16	14	30	30		
1	WiSe	Monastir	Basic	Elective	-		30	DDKM
2	SuSe	Kassel	Basic	Elective	-		30	
3	WiSe	Cairo	-		Elective	-	30	
4	SuSe	MENA-Region/Germany	-			Thesis	30	

Table 2: Study plan of Mode "2" for double-degree DDKM starting in WiSe.

Mode "3": starting in the summer semester (SuSe)								
Semester	WiSe/SuSe	Site	ECTS				ECTS per Semester	Type of Double-Degree
			16	14	30	30		
1	SuSe	Kassel	Basic	Elective	-		30	DDKC
2	WiSe	Cairo	Basic	Elective	-		30	
3	SuSe	Kassel	-		Elective	-	30	
4	WiSe	MENA-Region/Germany	-			Thesis	30	

Table 3: Study plan of Mode "3" for double-degree DDKC starting in SuSe.

Mode "4": starting in the summer semester (SuSe)								
Semester	WiSe/SuSe	Site	ECTS				ECTS per Semester	Type of Double-Degree
			16	14	30	30		
1	SuSe	Kassel	Basic	Elective	-		30	DDKM
2	WiSe	Monastir	Basic	Elective	-		30	
3	SuSe	Kassel	-		Elective	-	30	
4	WiSe	MENA-Region/Germany	-			Thesis	30	

Table 4: Study plan of Mode "4" for double-degree DDKM starting in SuSe.

Mode “5”: starting in the summer semester (SuSe)								
Semester	WiSe/SuSe	Site	ECTS				ECTS per Semester	Type of Double-Degree
			16	14	30	30		
1	SuSe	Kassel	Basic	Elective	-		30	DDKC
2	WiSe	Cairo	Basic	Elective	-		30	
3	SuSe	X	-		Elective	-	30	
4	WiSe	MENA-Region/Germany	-			Thesis	30	

Table 5: Study plan of Mode “5” for double-degree DDKC starting in SuSe and with site X of the university participating in the REMENA-Network.

Mode “6”: starting in the summer semester (SuSe)								
Semester	WiSe/SoSe	Site	ECTS				ECTS per Semester	Type of Double-Degree
			16	14	30	30		
1	SuSe	Kassel	Basic	Elective	-		30	DDKM
2	WiSe	Monastir	Basic	Elective	-		30	
3	SuSe	X	-		Elective	-	30	
4	WiSe	MENA-Region/Germany	-			Thesis	30	

Table 6: Study plan of Mode “6” for double-degree DDKM starting in SuSe and with site X of the university participating in the REMENA-Network.

In Table 5 and 6, the sign X refers to the site of the universities which are participating in the REMENA-Networks e.g. Sfax in Tunisia. In particular, Kassel is the only site which offers the modes “3” and “4” in two different semesters according to study plans.

Annex B: Study and Examination Plan

Number/Type/Title	**Basic Module Thermodynamic Basics**
Name of Module	**Thermodynamic Basics**
Type of Module	Basic
Learning Outcome, Skills and Qualification Objectives	• implement the first and second law of thermodynamics on thermal systems • interpret property tables and create energy balances • analyze power and refrigeration cycle performance • conduct basic principles of heat transfer and its basic modes on energy systems • assess temperature distribution and heat flow regarding heat exchangers and insulations • conduct conservation equations on fluid flow • implement fluid flow dimensional analysis on pressure losses and pumping power requirements • perceive next generation photovoltaic and optoelectronic materials used in photovoltaic applications • interpret advanced membrane materials
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	150 hours course attendance 100 hours self-study
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Written exam, 2 hours
Number of Credits for the Module	10

Number/Type/Title	Basic Module Energy and Thermodynamic Basics
Name of Module	**Energy and Thermodynamic Basics**
Type of Module	Basic
Learning Outcome, Skills and Qualification Objectives	• know the basic concepts, principles and the properties of thermodynamics and thermodynamic equilibria of pure fluids and mixtures • control the mass balance, energy and entropy and exergy analysis of thermodynamic systems and processes • master the wet air diagram and unit operations of the air treatment • know the basic concepts of thermal laws and identify the three ways of heat transfer (conduction, convection, radiation) • set equation and solve a simple problem of heat transfer in the case of regular geometries subjected to different types of boundary conditions • understand, model and control analytical and numerical techniques for solving heat conduction problems • define and implement a heat conduction equation problem and choose the appropriate method to solve and interpret the numerical results • measure the pressure and the velocity • calculate hydrostatic strength • determine the velocity profiles (in a pipe and inside the boundary layer) and determine the friction forces
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	150 hours course attendance 100 hours self-study
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Written exam, 2 hours
Number of Credits for the Module	10

Number/Type/Title	**Basic Module Engineering Basics**
Name of Module	**Engineering Basics**
Type of Module	Basic
Learning Outcome, Skills and Qualification Objectives	• analyse electrical circuits and using measuring instruments and sensors • apply principles of energy conversion (mechanical / electrical) • understand the specific terms and problems of control theory • analyse simple linear control systems • calculate flow of forces in static systems • solve simple dynamic issues (e.g. problems between turbines and ground) • understand functions and their differentiation and integration • describe systems based on linear and non-linear operators (deterministic and stochastic) • analyse system design and simulation using numerical methods
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	150 hours course attendance 100 hours self-study
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	
Student Assessment	Written exam, 2 hours
Number of Credits for the Module	10

Number/Type/Title	**Basic Module Language and Presentation**
Name of Module	**Language and Presentation**
Type of Module	Basic
Learning Outcome, Skills and Qualification Objectives	• implement basic formulations and expressions of German and Arabic for use in daily life • interpret the concepts of presentation and moderation for efficient meeting organization, discussion and moderation techniques • implement presentation and moderation techniques (suitable material, personal presentation, moderation skills) on a professional level
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	90 hours course attendance 60 hours self-study
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Written exam, 2 hours; Presentation and moderation project
Number of Credits for the Module	6

Number/Type/Title	**Basic Module Language and Communication Competencies**
Name of Module	**Language and Communication Competencies**
Type of Module	Basic
Learning Outcome, Skills and Qualification Objectives	• improve their language skills in German and Arabic to communicate with basic formulations and expressions for use in daily life • interpret the concepts of presentation for efficient meeting organization, discussion and moderation techniques • rule of different presentations, develop a strategy for presentation, plan and handle of presentation materials and facilities • provide advanced presentation and moderation techniques, improve delivery habits, achieve an efficient meeting organization
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	90 hours course attendance 60 hours self-study
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Written exam, 2 hours
Number of Credits for the Module	6

Number/Type/Title	**Basic Module Intercultural Competencies**
Name of Module	**Intercultural Competencies**
Type of Module	Basic
Learning Outcome, Skills and Qualification Objectives	• understand the institutional set-up of bilateral and multilateral development cooperation with special reference to the Arab world • work with political, economic and cultural objectives and instruments of German-Arab relation • meta-cognitively reflect communication relevant factors in perception and assessment of situations and critical incidents in every day- and project-related communication • monitor the personal adaptation process • generate a portfolio of tools for an empathic approach to effectively communicate and work in intercultural teams • communicate with elaborated formulations and expressions for use in daily life
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	90 hours course attendance 60 hours self-study
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Written exam, 2 hours; Presentation; Project; Written report
Number of Credits for the Module	6

Number/Type/Title	**Basic Module Thesis Project**
Name of Module	**Thesis Project**
Type of Module	Basic
Learning Outcome, Skills and Qualification Objectives	• write a scientific report and presentation of results in a colloquium • investigate literature and internet based sources • work independently and scientifically
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	Modules passed to the extent of at least 54 credits
Student Workload	740 hours independent research 160 hours writing thesis
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Report and Colloquium
Number of Credits for the Module	30

Number/Type/Title	**Elective Module Bio Energy**
Name of Module	**Bio Energy**
Type of Module	Elective
Learning Outcome, Skills and Qualification Objectives	• assess different types of bio energy sources with focus on liquid fuels • evaluate different bio fuels • perceive sources, potentials and possible energetic use of bio waste
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	60 hours course attendance 40 hours self-study
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Written exam, 2 hours
Number of Credits for the Module	4

Number/Type/Title	**Elective Module Development of Renewable Energy Projects**
Name of Module	**Development of Renewable Energy Projects**
Type of Module	Elective
Learning Outcome, Skills and Qualification Objectives	• plan a renewable energy project, select site and technology • conduct tendering process and licensing • perceive commissioning processes, operation and maintenance practice in RE/EE projects
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	75 hours course attendance 50 hours self-study
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Written exam, 2 hours; Group presentation
Number of Credits for the Module	5

Number/Code	**Elective Module Fundamentals of REEE**
Name of Module	**Fundamentals of REEE**
Type of Module	Elective
Learning Outcome, Skills and Qualification Objectives	• perceive the basics of the different energy forms and conversion technologies • assess conversion efficiencies for different forms of energy • distinguish energy supply and demand patterns • review different energy conservation technologies/opportunities
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	105 hours course attendance 70 hours self-study
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Written exam, 2 hours
Number of Credits for the Module	7

Number/Type/Title	Elective Module Solar Energy Devices
Name of Module	**Solar Energy Devices**
Type of Module	Elective
Learning Outcome, Skills and Qualification Objectives	• distinguish solar thermal devices for domestic hot water with respect to radiation circumstances and geographical position • assess design and dimensioning of different solar thermal energy devices for domestic hot water, space and swimming pool heating and air conditioning • recognize operating limits of non-focusing collectors and the need for focusing collectors, the different types of solar concentrators and their relative merits • assign output power, delivery temperatures and performance indices for different kinds of solar concentrator technologies • distinguish the solar radiation on oriented surfaces • perceive the physics of photovoltaic cell materials, production, modules structure and basic electrical characteristics of the solar module
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	90 hours course attendance 60 hours self-study
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Written exam, 2 hours
Number of Credits for the Module	6

Number/Type/Title	Elective Module Economic and Ecological Aspects of REEE
Name of Module	**Economic and Ecological Aspects of REEE**
Type of Module	Elective
Learning Outcome, Skills and Qualification Objectives	• recognize different effects of energy use on environment, society and economy, methods of greenhouse gas balances and concepts for mitigation • distinguish different energy concepts relating to their environmental impacts • assess economic aspects of production, distribution, consumption of energy and energy trade (including sustainability aspects) • interpret economic and administrative rules and regulations, functions and structure of regional, national and international organisations involved in the energy sector • interpret basic economic concepts (e.g. demand supply equilibrium, risk analysis, depreciation) • conduct feasibility studies, concepts of decision making, cost estimation techniques and funding strategies • assign conversion efficiencies for different forms of energy with special respect to implementation in MENA Region
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	120 hours course attendance 80 hours self-study
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Written exam, 2 hours; Group presentation
Number of Credits for the Module	8

Number/Type/Title	**Elective Module Advanced Energy Engineering**
Name of Module	**Advanced Energy Engineering**
Type of Module	Elective
Learning Outcome, Skills and Qualification Objectives	• evaluate the radiative exchange in a thermal system; understand the effect of radiative properties, geometry and arrangement of surfaces on the involved radiative fluxes; size and choose different types of heat exchange and determine the thermal loads of the premises • calculate and size different elements of a hydraulic system • study the forces and the resulting motions of the objects through the air
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	90 hours course attendance 60 hours self-study
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Written exam, 2 hours
Number of Credits for the Module	6

Number/Type/Title	Elective Module Energy and Environment
Name of Module	**Energy and Environment**
Type of Module	Elective
Learning Outcome, Skills and Qualification Objectives	• recognize the effect of energy use on the environment • drive a sustainable energy management • identify the improvement areas and cost reduction • implement an energy management system • know and interpret the requirements of ISO 14001 • acquire the tools and measurement indicators for the successful ISO 14001 certification
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	60 hours course attendance 40 hours self-study
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Written exam, 2 hours
Number of Credits for the Module	4

Number/Type/Title	Elective Module Management and Engineering Mathematics
Name of Module	**Management and Engineering Mathematics**
Type of Module	Elective
Learning Outcome, Skills and Qualification Objectives	• develop and use numerical simulation codes of flow and heat and mass transfer • optimize general energy problems • apply the selection criteria of project management • understand and acquire the necessary tools' aspects of industrial marketing
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	75 hours course attendance 50 hours self-study
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Written exam, 2 hours
Number of Credits for the Module	5

Number/Type/Title	**Elective Module Solar Energy Subsystems**
Name of Module	**Solar Energy Subsystems**
Type of Module	Elective
Learning Outcome, Skills and Qualification Objectives	• assign output power, delivery temperatures and performance indices for different kinds of solar collectors • perceive the physics of photovoltaic cell materials, production and modules structure
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	75 hours course attendance 50 hours self-study
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Written exam, 2 hours
Number of Credits for the Module	5

Number/Type/Title	**Elective Module Geothermal Energy**
Name of Module	**Geothermal Energy**
Type of Module	Elective
Learning Outcome, Skills and Qualification Objectives	• identify and characterize the geothermal prospects and the techniques for drilling wells into geothermal formations to extract hot fluids • discuss the general concepts of geothermal power plants • define the main characteristics of the geothermal fluids used in space or district heating • describe the main features of the absorption cycles used for air conditioning and industrial refrigeration in geothermal applications • discuss the factors influencing greenhouse climate
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	75 hours course attendance 50 hours self-study
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Written exam, 2 hours
Number of Credits for the Module	5

Number/Type/Title	**Elective Module Combined Cooling, Heating and Power (CCHP)**
Name of Module	**Combined Cooling, Heating and Power (CCHP)**
Type of Module	Elective
Learning Outcome, Skills and Qualification Objectives	• provide the basic building blocks of CCHP • provide potential solutions • define the steps to choose and implement such solutions
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	75 hours course attendance 50 hours self-study
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Written exam, 2 hours
Number of Credits for the Module	5

Number/Type/Title	**Elective Module Economic Activities of Germany in the MENA Region**
Name of Module	**Economic Activities of Germany in the MENA Region**
Type of Module	Elective
Learning Outcome, Skills and Qualification Objectives	• understand the driving factors of energy costs and how energy pricing can influence supply and demand • read and assess cost-benefit-analyses • reflect key factors, methods and the necessary framework for a company to get into the market of a country
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	60 hours course attendance 40 hours self-study
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Group presentation; Report
Number of Credits for the Module	4

Number/Type/Title	Elective Module Wind Energy Technology
Name of Module	**Wind Energy Technology**
Type of Module	Elective
Learning Outcome, Skills and Qualification Objectives	• apply their gained knowledge about the design of different wind turbines resp. single components and their material requirements on specific locations • identify the optimal location for a planned wind farm and to develop it after analyzing the requirements for construction, logistics and grid connection as well as national standards • distinguish the design of different types of Wind Energy Converter and to analyze their function in different control concepts • be aware of different electrical networks and possible problems related with grid integration and grid control • apply mathematical models for control system design and plant simulation
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	90 hours course attendance 60 hours self-study
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Written exam, 2 hours
Number of Credits for the Module	6

Number/Type/Title	**Elective Module Energy Efficiency and Storage**
Name of Module	**Energy Efficiency and Storage**
Type of Module	Elective
Learning Outcome, Skills and Qualification Objectives	• distinguish different storage technologies and their role for the RE system • compare costs and potentials of EE processes and storage systems • analyze and model industrial EE systems
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	120 hours course attendance 80 hours self-study
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Written exam, 2 hours; Oral exam
Number of Credits for the Module	8

Number/Type/Title	Elective Module Scientific Programming and Publishing
Name of Module	**Scientific Programming and Publishing**
Type of Module	Elective
Learning Outcome, Skills and Qualification Objectives	• understand the approaches for numerical simulation in the field of renewable energy and energy efficiency • write a code for different optimization problems • gain a sophisticated structuring abilities • use a very advanced math typesetting • build a sophisticated report or presentation without caring of the outlook but only about the content • build the main structure of the scientific report • know the different steps in order to write a scientific report, from the brainstorming to the final version • professionally customize the look of the report • learn how to build a consistent and more easily and changeable report or presentation
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	45 hours course attendance 40 hours self-study
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Oral exam, 2 hours; Report
Number of Credits for the Module	6

Number/Type/Title	Elective Module Practical Aspects of REEE
Name of Module	**Practical Aspects of REEE**
Type of Module	Elective
Learning Outcome, Skills and Qualification Objectives	• understand the design, problems and operation of integrated grids with respect to the specific properties of renewable energies • apply advanced schemes like online-monitoring and forecasting • understand physical and technical aspects of energy flows in buildings • identify heat gains, heat losses and cooling demand of rooms • determine life cycle costs and life cycle assessment of environmental impacts in the building sector • understand the basics of life cycle assessment for different renewable energy sources • investigate energy costs and determine roughly costs under different conditions (sizes, boundary conditions, etc.) • determine the heat value of fuels and determine and assess emissions of the burning process
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	105 hours course attendance 70 hours self-study
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Written exam, 2 hours; Oral exam
Number of Credits for the Module	7

Number/Type/Title	**Elective Module Project Management**
Name of Module	**Project Management**
Type of Module	Elective
Learning Outcome, Skills and Qualification Objectives	• break down a project into its basic elements • identify specific needs and targets of international projects • investigate success factors for executing RE projects, specifically in the development cooperation between Germany and Arab countries • use the key elements of project management cycle • elaborate a project proposal themselves (in a final workshop) • understand the importance of environmental assessment studies • analyze critically socio-economic effects of RE projects, worldwide as well as regional
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	75 hours course attendance 50 hours self-study
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Written exam, 2 hours; Presentation, Report
Number of Credits for the Module	5

Number/Type/Title	Elective Module Solar Energy Systems
Name of Module	**Solar Energy Systems**
Type of Module	Elective
Learning Outcome, Skills and Qualification Objectives	• understand the use of solar thermal energy for air conditioning • analyse the size of solar thermal plants for air conditioning (as components and as total system) and the connection of the system to the building • reflect the fundamental characteristics and capabilities as well as impacts of concentrating solar power (CSP) stations within national electricity supply schemes • understand the fundamentals of international cooperation for solar electricity export and long-distance transmission • assess the technical and economic potential of CSP in a country and to identify the best sites for project development • select optimal (standalone, decentralized) PV systems according to specific application and resources conditions • estimate the techno-economic performance criteria • implement standard PV simulation software tools for system design
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	90 hours course attendance 60 hours self-study
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Written exam, 2 hours; Group report
Number of Credits for the Module	6

Number/Type/Title	Elective Module RE Integration
Name of Module	**RE Integration**
Type of Module	Elective
Learning Outcome, Skills and Qualification Objectives	• understand the key drivers as well as design principles of the smart grid (communication) • evaluate the communication infrastructure required to set up smart grids • understand the requirements for balancing fluctuating renewable power generation and select solutions for these different requirements • estimate potentials and costs in the control of flexible generators and consumers in domestic and industrial applications • determine bio mass potentials taking into account different bio mass conversion processes and local potentials • analyse the sustainability of the whole value chain
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	105 hours course attendance 70 hours self-study
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Written exam, 2 hours; Oral exam
Number of Credits for the Module	7

Number/Type/Title	Elective Module Control Oriented Modelling of AC Actuators
Name of Module	**Control Oriented Modelling of AC Actuators**
Type of Module	Elective
Learning Outcome, Skills and Qualification Objectives	• make the synthesis and the implementation of induction machine vector control strategies • make the synthesis and the implementation of induction machine direct torque control strategies • make the synthesis and the implementation of induction machine direct power control strategies • make the synthesis and the implementation of synchronous machine vector control strategies • make the synthesis and the implementation of synchronous machine direct torque control strategies • make the synthesis and the implementation of synchronous machine maximum torque per ampere control strategies
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	30 hours course attendance 40 tutored project
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Written exam, 2 hours; Presentation
Number of Credits for the Module	4

Number/Type/Title	**Elective Module FEA Modelling of AC Actuators (level 1)**
Name of Module	**FEA Modelling of AC Actuators (level 1)**
Type of Module	Elective
Learning Outcome, Skills and Qualification Objectives	• make the synthesis and the analytical resolution of the electrostatic model • make the synthesis and the analytical resolution of the magneto-static model • make the synthesis and the analytical resolution of the electro-magnetic system model • make the synthesis of finite element model • make the resolution of finite element mode • make the numerical resolution of the finite element method
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	45 hours course attendance 30 hours self-study
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Written exam, 2 hours
Number of Credits for the Module	3

Number/Type/Title	**Elective Module FEA Modelling of AC Actuators (level 2)**
Name of Module	**FEA Modelling of AC Actuators (level 2)**
Type of Module	Elective
Learning Outcome, Skills and Qualification Objectives	• establish the model and make the numerical resolution of the linear electrostatic model • establish the model and make the numerical resolution of the linear magneto-static model • establish the model and make the numerical resolution of the linear electro-magnetic model • establish the model and make the numerical resolution of the non-linear electrostatic model • establish the model and make the numerical resolution of the non-linear magnetostatic model • establish the model and make the numerical resolution of the non-linear electromagnetic model
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	30 hours course attendance 40 hours self-study
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Written exam, 2 hours; Presentation
Number of Credits for the Module	4

Number/Type/Title	**Elective Module Embedded Energy Storage Systems**
Name of Module	**Embedded Energy Storage Systems**
Type of Module	Elective
Learning Outcome, Skills and Qualification Objectives	• understand why we must store in an isolated system • understand why we should store in a system connected to the network • understand at what level we can store • understand the main electrical energy storage technologies • choose the good electric storage system according to the application • size the chosen electric storage system taking into account the imposed constraints • evaluate the performances of the studied hybrid system
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	30 hours course attendance 40 hours self-study
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Written exam, 2 hours; Presentation
Number of Credits for the Module	4

Number/Type/Title	**Elective Module Special AC Actuators**
Name of Module	**Special AC Actuators**
Type of Module	Elective
Learning Outcome, Skills and Qualification Objectives	• understand the principle of operation of switched reluctance machines • understand the principle of torque production in switched reluctance machines • understand the principle of operation of axial flux machines • understand the principle of torque production in axial flux machines • understand the principle of operation of transverse flux machines • understand the principle of torque production of transverse flux machines • identify the advantages and limitations of different transverse flux machine topologies
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	45 hours course attendance
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Written exam, 2 hours
Number of Credits for the Module	3

Number/Type/Title	**Elective Module Diagnosis, Monitoring and Reconfiguration of Electric Machines Drives**
Name of Module	**Diagnosis, Monitoring and Reconfiguration of Electric Machines Drives**
Type of Module	Elective
Learning Outcome, Skills and Qualification Objectives	• have an overview on the most common faults occurring in AC electric drives (induction and synchronous machines) • distinguish the different type of defaults weather they are mechanically- or electrically- caused • predict faults on the different electric drive components • know the diagnosis procedure when the data acquisition process may reveal abnormal operating conditions • distinguish between model-based and data-based diagnosis method and their cases of usage • determine the parameters and variables to diagnose and use the appropriate model to predict it
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	45 hours course attendance
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Written exam, 2 hours
Number of Credits for the Module	3

Number/Type/Title	**Elective Module Control Strategies of Electric Drives**
Name of Module	**Control Strategies of Electric Drives**
Type of Module	Elective
Learning Outcome, Skills and Qualification Objectives	• make the synthesis and the implementation of the RFOC strategy of the IM • make the synthesis and the implementation of the DTC strategy of the IM • make the synthesis and the implementation of DPC strategies for the control of the three-phase PWM rectifiers
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	45 hours course attendance 40 tutored project
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Written exam, 2 hours; Presentation
Number of Credits for the Module	3

Number/Type/Title	**Elective Module Power Electronic Converters**
Name of Module	**Power Electronic Converters**
Type of Module	Elective
Learning Outcome, Skills and Qualification Objectives	• make the synthesis and the implementation of different pulse-width modulation techniques for the control of three-phase two-level voltage source inverter • to make the synthesis and the implementation of different PWM techniques for the control of three-phase three-level voltage source inverter • make the modelling and the implementation of different modulation techniques for the control of matrix converters
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	45 hours course attendance 40 tutored project
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Written exam, 2 hours; Presentation
Number of Credits for the Module	3

Number/Type/Title	**Elective Module Embedded Generating Systems**
Name of Module	**Embedded Generating Systems**
Type of Module	Elective
Learning Outcome, Skills and Qualification Objectives	• identify the components of embedded generating systems • classify the embedded generating systems • establish the magnetic equivalent circuit of CPAs • predict the no- and load features of CPAs • rethought the design of CPAs • design hybrid excited CPAs • identify the components of avionic generating systems • classify the avionic generating systems
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	60 hours course attendance
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Written exam, 2 hours
Number of Credits for the Module	4

Number/Type/Title	**Elective Module Rules of Writing Research Documents**
Name of Module	**Rules of Writing Research Documents**
Type of Module	Elective
Learning Outcome, Skills and Qualification Objectives	• learn efficient ways to organize the reading method with some useful hints for successful reading • distinguish between the different type of scientific writing • learn how to structure scientific writing and elaborate a work plan • know the different steps in order to write a scientific paper, from the brainstorming to the final version of the document • acknowledge the major difficulties in scientific writing and the possible solutions
Type of Course	EX, K, KO, S, VL+P
Preconditions for Participation in the Module	-
Student Workload	45 hours course attendance
Performance Criteria	EX, K, KO, S, VL+P
Preconditions for Participation in the Exam	-
Student Assessment	Written exam, 2 hours
Number of Credits for the Module	3

Annex C: Diploma Supplement (TO BE ADDED SOON!)

Annex D: Converting the Egyptian and Tunisian Grading Scales to the German Scales

The following table shows the grade conversion between Egypt (CU), Tunisia (UM) and Germany (UKAS).

Ägypten	Tunesien	Deutschland
100	20	1,0
100	19	1,0
100	18	1,0
100	17	1,0
100	16	1,0
99	15	1,0
98	14,75	1,3
97	14,5	1,3
96	14,25	1,3
95	14	1,3
94	13,75	1,7
93	13,5	1,7
92	13,25	1,7
91	13	1,7
90	12,75	2,0
89	12,5	2,0
88	12,25	2,0
87	12	2,0
86	11,75	2,3
85	11,5	2,3
84	11,25	2,3
83	11	2,3
82	10,95	2,7
81	10,9	2,7
80	10,85	2,7
79	10,8	2,7
78	10,75	3,0
77	10,7	3,0
76	10,65	3,0
75	10,6	3,0
74	10,55	3,3
73	10,5	3,3
72	10,45	3,3
71	10,4	3,3
70	10,35	3,7
69	10,3	3,7
68	10,25	3,7
67	10,2	3,7
66	10,15	4,0
65	10,15	4,0
64	10,15	4,0
63	10,1	4,0
62	10,1	4,0
61	10,1	4,0
60	10,1	4,0
59	10,05	4,0
58	10,05	4,0
57	10,05	4,0
56	10,05	4,0
55	10,05	4,0
54	10	4,0
53	10	4,0
52	10	4,0
51	10	4,0
50	10	4,0
49	9,9	n.b.