ASIIN Seal

Accreditation Report

Master's Degree Program / PhD Program
Renewable Energy
Electrical Power Systems
Energy Economics

Provided by
University of Rwanda – African Centre of Excellence in Energy for Sustainable Development

Version: 25 March 2025

Table of Content

A About the Accreditation Process

Name of the degree program (in original language)	(Official) English translation of the name	Labels applied for [1]	Previous accreditation (issuing agency, validity)	Involved Technical Committees (TC)[2]
Master of Science in Renewable Energy	Master of Science in Renewable Energy	ASIIN	/	02
PhD by Research in Renewable Energy	PhD by Research in Renewable Energy	ASIIN	/	02
Master of Science in Electrical Power Systems	Master of Science in Electrical Power Systems	ASIIN	/	02
PhD by Research in Electrical Power Systems	PhD by Research in Electrical Power Systems	ASIIN	/	02
Master of Science in Energy Economics	Master of Science in Energy Economics	ASIIN	/	02, 06
PhD by Research in Energy Economics	PhD by Research in Energy Economics	ASIIN	/	02, 06
Date of the contract: 11.07.2022 **Submission of the final version of the self-assessment report:** 03.08.2022 **Date of the onsite visit:** 21./22.03.2023 **at:** University of Rwanda				
Expert panel: Prof. Dr. Dirk Dahlhaus, University of Kassel Prof. Dr. Elmar Griese, University of Siegen				

[1] ASIIN Seal for degree programs

[2] TC: Technical Committee for the following subject areas: TC 02 - Electrical Engineering/Information Technology; TC 06 - Engineering and Management, Economics

Prof. Dr. Frank Schultmann, Karlsruhe Institute of Technology Dr. Francis Xavier Ochieng, Jomo Kenyatta University of Agriculture and Technology Stephan Reinisch, The Energy Engineers Desmond Jacob Wandola, Jomo Kenyatta University of Agriculture and Technology	
Representative of the ASIIN headquarter: Sophie Schulz	
Responsible decision-making committee: Accreditation Commission	
Criteria used: European Standards and Guidelines as of May 15, 2015 ASIIN General Criteria, as of December 07, 2021 Subject-Specific Criteria of Technical Committee 02 – Electrical Engineering/Information Technology as of September 23, 2022 ASIIN Additional Criteria for Structured Doctoral Programs as of March 15, 2021	

B Characteristics of the Degree Programs

a) Name	Final degree (original/English translation)	b) Areas of Specialization	c) Corresponding level of the EQF[3]	d) Mode of Study	e) Double/Joint Degree	f) Duration	g) Credit points/unit	h) Intake rhythm & First time of offer
Master of Science in Electrical Power Systems	M.Sc.	/	7	Full time	/	4 semesters	240 Credits	09/2018, annually
PhD by Research in Electrical Power Systems	PhD	/	8	Full time / part time	/	Full time: 8 semesters; part time: 12 semesters	360 Credits	10/2017, annually
Master of Science in Energy Economics	M.Sc.	/	7	Full time	/	4 semesters	240 Credits	09/2018, annually
PhD by Research in Energy Economics	PhD	/	8	Full time / part time	/	Full time: 8 semesters; part time: 12 semesters	360 Credits	10/2017, annually
Master of Science in Renewable Energy	M.Sc.	/	7	Full time	/	4 semesters	240 Credits	09/2018, annually
PhD by Research in Renewable Energy	PhD	/	8	Full time / part time	/	Full time: 8 semesters; part time: 12 semesters	360 Credits	10/2017, annually

[3] EQF = The European Qualifications Framework for lifelong learning

C Expert Report for the ASIIN Seal[4]

1. The Degree Program: Concept, content & implementation

Criterion 1.1 Objectives and learning outcomes of a degree program (intended qualifications profile)

Evidence:

- Learning objectives per program
- Degree program specification per program
- Module descriptions per program
- Self-assessment report
- Discussions during the on-site visit

Preliminary assessment and analysis of the experts:

The Africa Center of Excellence in Energy for Sustainable Development (ACE-ESD) is hosted by the University of Rwanda within the College of Science and Technology. It is one of 24 Africa Centers of Excellence financed under the World Bank's Eastern and Southern Africa Higher Education Centers of Excellence.

The six programs under review in Electrical Powers Systems, Renewable Energy, and Energy Economics were introduced in 2017 based on the curricula developed in 2015-2016 and in accordance with the guidelines, policies, and laws of the Rwandan Higher Education Council.

The ACE-ESD has described program objectives and learning outcomes for all six degree programs. The experts approve that for each program a presentation of learning outcomes is given in combination with learning outcome matrices matching the described learning outcomes with the respective modules of the programs. A detailed overview of the defined learning outcomes for each program can be found in the appendix of this document (pp. 22-39).

[4] This part of the report applies also for the assessment for the European subject-specific labels. After the conclusion of the procedure, the stated requirements and/or recommendations and the deadlines are equally valid for the ASIIN seal as well as for the sought subject-specific label.

The experts refer to the ASIIN Subject-Specific Criteria (SSC) of the Technical Committee 02 – Electrical Engineering/Information Technology, the learning outcome matrices, and the modules as a basis for judging whether the intended learning outcomes of the programs correspond with the competences as outlined by the SSC.

Although the experts generally acknowledge that the university has formally defined and described learning objectives for all programs, they note that they are written in a rather generic manner and to a large extent do not reflect the level of academic qualification aimed at. They all lack an adequate scientific level and thus do not adhere to the standards of EQF level 7 (for the master's programs) and EQF level 8 (for the PhD programs) programs. In particular, although the nexus of theory and practice is mentioned several times both in the self-assessment report and during the on-site visit, it remains unclear from the learning objectives and curricula whether the programs are scientifically or rather practically oriented. Although the different stakeholders constantly point out the scientific focus of all six programs, the qualification objectives of the degree programs show a rather professional focus and lack an adequate scientific aspect. This becomes also apparent when looking closer at the individual modules, where the objectives and learning outcomes do not sufficiently cover research skills or methodological competencies. Thus, the qualification objectives indicate a very high level of applied relevance. The experts, however, emphasize the necessity of students being trained to do scientifically sound work, in particular if they aim at obtaining a degree at master's level, and even more so at doctoral level.

According to the self-assessment report, the overall aim of the programs offered by the ACE-ESD is capacity building of the East and Southern African region's professionals and experts in the energy sector to undertake interdisciplinary research and training in energy technologies, which in turn are tailored to serve remote and/or rural areas. In this regard, the programs intend to contribute to rural development through technology transfer, and nurture and promote entrepreneurship development in the energy sector towards sustainable development. In the context of the PhD programs, even the research topics are constrained to address solving the development priorities of the Eastern and Southern African region through the application of energy technologies. Similarly, all requirements for master's degree programs described in the respective ASIIN SSC are limited to regional aspects and thus address (product) development skills and applications more or less exclusively in the aforementioned African framework. During the different discussions, the experts learn that the ACE-ESD is currently adapting the programs and adding contents that are tailored towards more global challenges. Thus, the aim is to revise and adapt the curricula according to the dynamic changes taking place in technology and energy. The experts appreciate that the ACE-ESD has understood the importance of integrating more globally/internationally relevant topics into the overall objectives of the programs and the curricula. However, by the time of the on-site visit, this remains only an idea for the future. Thus, the experts urge the institution to actively work on the revision of both the objectives and the curricula in order to meet the international standards for all six programs. The experts also stress that during this revision process, a labor market analysis should be conducted in order to clearly identify the demands of the industry and how the graduates' profiles of the different programs will meet them.

In summary, the experts are of the opinion that although the ACE-ESD has defined qualification objectives for all degree programs, these must be rewritten in order to adhere to the targeted academic level and thus match EQF level 7 for the master's programs and EQF level 8 for the PhD programs. The missing aspects, in particular the scientificity of the educational programs and the precise employment opportunities of the graduates must be clearly reflected in the learning objectives of each program.

Criterion 1.2 Name of the degree program

Evidence:

- Degree program specification per program
- Self-assessment report
- Discussions during the on-site visit

Preliminary assessment and analysis of the experts:

Overall, the expert panel considers the names of the study programs to be reflecting the respective aims, learning outcomes, and curricula as well as the course language. The experts state that the titles of the programs are standard ones and in general reflect the overall objectives of the programs. Yet, the contents in the different programs do not always seem to match with what is internationally considered the state of the art in the corresponding fields (cf. criterion 1.3).

Criterion 1.3 Curriculum

Evidence:

- Degree program specification per program
- Module descriptions per program
- Self-assessment report
- Discussions during the on-site visit

Preliminary assessment and analysis of the experts:

The curricula of the six programs are designed to comply with the program objectives and learning outcomes, and, according to the self-assessment report, are subject to continuous revision processes. As such, the curricula are reviewed regularly and commented on by students and lecturers as well as by external stakeholders such as partners from the private sector. Besides the objectives and learning outcomes defined by the ACE-ESD itself, the curricula also consider the Rwandan standards of higher education and the national qualifications frameworks set by the Rwandan Higher Education Council.

All three master's programs have a study duration of four years during which the students earn 240 Rwandan credit points. The master's programs are currently only offered in full-time mode. The three PhD programs can be studied either in full-time or in part-time mode and have a duration of 4 (full time) or six (part time) years, during which the students earn 360 Rwandan credit points. A detailed overview of each curriculum for the master's programs as well as a common timeline/study plan for all PhD programs can be found in the appendix of this document (pp. 29-47).

As already discussed in criterion 1.1, the experts are not convinced, that the study programs are at a level that is appropriate for master's programs (EQF level 7) or PhD programs (EQF level 8). When reviewing the curricula as well as the module descriptions of the three master's programs, they miss both a deepening and a broadening of the knowledge acquired during the students' previous studies and notice a clear lack of R&D components in the curricula. The experts find that – although the sequence of courses and the topics chosen do in general follow a clear learning path – many of the modules in the master's programs cover only basic competencies rather than broadening or deepening them, which does not do justice to a level EQF 7. Moreover, the curricula are also considered insufficient, as several relevant topics are not covered at all in the three master's programs when comparing them to the overall international standard. While constrained optimization has a weak footprint in the curricula, software tools do not seem to be treated at all. Similarly, SCADA approaches and power engineering related software are not part of the Electric Power Systems and Renewable Energy programs. In the Energy Economics program, it remains unclear whether fundamental cost metrics such as the levelized cost of electricity (LCOE) are treated in depth. Other aspects being relevant in the European power management context such as cross-border transport capacities, congestion and alike are not treated either. Next to the missing contents, the experts also find that a large part of the courses of all three programs cover topics that do not correspond with master's level requirements. The experts are therefore of the opinion that the curricula of the three master's programs need to be redesigned in order to meet the requirements of a master's program (EQF 7). This should be done in accordance with the revision of the qualification objectives, as all shortcomings identified there are also reflected in the curricula. This applies not only to the deepening or broadening of subject-specific knowledge, but also to the scientific aspects of the training, because in all study programs students do not learn sufficiently how to work scientifically or how to use scientific methods.

Concerning the PhD programs, the experts are of the opinion that they not only follow a rather strict study plan, but that the students are restricted in choosing their research topics and their creativity, which makes the programs to be overall more conformal with a curriculum of a regular master's program. As was discussed already under criterion 1.1, the overall aim of all programs offered by the ACE-ESD is to train experts for the needs and challenges of the Southern and Eastern African region, which is why the PhD programs mostly address topics in a regional context as well. Although the program coordinators explain that the ACE-ESD does not force its students to focus on regional topics, this contradicts with the overall aim of the ACE-ESD and also the student works presented to the experts speak otherwise. Moreover, what is striking is the fact that the PhD programs lack doctoral seminars and exchange with other scientists, and thus do not meet the standards of a doctoral degree program on the European level (EQF 8).

Another issue the experts discover regarding the PhD programs concerns the internship that is integrated in each of the three programs. During the discussions on-site, the experts learn from the students that in practice, the internship phases do not work well. First, because it is difficult for the students to find appropriate placements. Second, all students agree that the internships are too time-consuming and that it is hardly possible to complete an internship and at the same time progress on the doctoral thesis. A far-reaching consequence in several cases has been the prolongation of the duration of the PhD program. In this context, the students also criticize that they were not fully aware of the conditions during the PhD (e.g. that a mandatory internship must be carried out) when applying for and enrolling in the program. The experts therefore urge the ACE-ESD to make sure that the rules, requirements and expectations for the PhD programs enable the students to finalize the program in the foreseen timeframe.

By the time of the on-site visit, the programs offered at ACE-ESD are designed based on a set of modules that are entirely mandatory. Thus, the programs do not offer any elective courses and hinder the individual specialization of students based on their interest or future career plan. During the discussions with the staff members and the students, the experts learn that both groups would highly welcome having the opportunity to integrate or take elective courses. The experts strongly support this view and strongly recommend the integration of electives into the curricula.

Mobility

The experts learn that an official framework for student mobility does not yet exist by the time of the on-site visit. The ACE-ESD does not promote (international) student mobility and it remains unclear if student mobility would be possible in the course of the current curricula without extending the regular duration of studies. Cooperation agreements with other universities exist only in very individual cases, and it seems that none of the stakeholders is aware of any possibilities related to academic mobility. The staff members also inform the experts that an official policy for the recognition of credits earned at other institutions does not exist. The ACE-ESD also does not have any official institution/responsible person that would advise and/or support students in the preparation, implementation and follow-up of an exchange. The experts therefore urge the ACE-ESD to establish a framework in order to enable student mobility (including the structural design of the degree programs, recognition rules and schemes, as well as support services).

Criterion 1.4 Admission requirements

Evidence:

- General academic regulations for postgraduate studies
- Admission regulations for postgraduate and PhD studies
- Self-assessment report
- Discussions during the on-site visit

Preliminary assessment and analysis of the experts:

The general admission process is described in and guided by the university’s general academic regulations for postgraduate studies. Program-specific admission requirements can be found on the university’s website.

To be admitted to the master’s programs Electrical Power Systems and Renewable Energy, applicants must have a bachelor’s degree with at least a second class, upper division or cumulative average score not less than 70% in Mechatronics, Mechanical Engineering, Electrical Engineering, Electro Mechanical Engineering, Renewable Energy Engineering or other related fields. Bachelor's degree holders from these disciplines with second class, lower division, and at least two years of relevant work experience are also eligible to apply.

To be admitted to the master’s program Energy Economics, applicants must have a bachelor's degree with at least a second class, upper division or cumulative average score not less than 70% in Economics, Accounting, Statistics, Engineering, Agricultural Economics, Quantitative Economics, Finance, or related fields. Bachelor's degree holders from these disciplines with second-class, lower division, and at least two years of relevant work experience are also eligible to apply.

Applicants for all three master's programs should demonstrate sufficient English language skills in order to undertake master's level course works and research.

After reviewing the documents, the experts notice that the admission requirements for the master's degree programs are rather unspecific, in the sense that they are open for graduates from a very wide range of different bachelor's degrees. For example, it remains unclear to the experts how graduates from Mechanical Engineering programs can be eligible for the Electrical Power Systems and Renewable Energy programs, as both of them clearly follow a strong focus in Electrical Engineering. Thus, graduates from Mechanical Engineering programs (and other disciplines as well) will lack a large part of relevant basic knowledge. This, in turn, is of particular importance, as the ACE-ESD has not defined any rules, processes or criteria for the compensation of missing prior knowledge. In theory, this means that a student with previous knowledge in a completely different field could apply for the programs and not be rejected. Thus, the experts ask the ACE-ESD to define binding rules for the compensation of missing admission requirements, e.g., in the form of compulsory qualification modules.

To be admitted to the PhD programs, applicants must hold a master's degree in a discipline relevant to the proposed research. Moreover, the applicant must have already taken training in research and completed a research project (final thesis) during the master's degree. Applicants whose work is part of a larger group project may register for a research degree, but each individual project must be distinguishable for the purposes of assessment and appropriate for the award being sought. In this case, the application must already clearly indicate the individual contribution and relationship to the project. The experts consider the admission criteria for the PhD programs to be appropriate and binding. However, they are not accessible to the stakeholders, which is why the experts ask the ACE-ESD to publish the admission criteria on the website.

Criterion 1.5 Workload and Credits

Evidence:

- Module descriptions per program
- Self-assessment report
- Discussions during the on-site visit

Preliminary assessment and analysis of the experts:

According to the self-assessment report, workload and credits at postgraduate level are based on the University of Rwanda's general academic regulations for postgraduate studies.

Credits and workload for the three master's programs are allocated based on program specialization. Professors, lecturers, and experts from collaborating industries with different expertise define class activities (lectures, laboratory works, seminars, and associated field works) and allocate hours per week for each module. A credit system based on the student workload is implemented and the ACE-ESD makes sure that all compulsory components of the curricula are credited and that credits are allocated to each module. However, the tables provided in the self-assessment report and evidencing documents only include contact hours, and the different stakeholders are unable to explain exactly if and how self-study time is calculated and integrated into the overall workload. Master's degrees are awarded after the student has successfully completed a master's program comprising of coursework and research and covering a total of 240 Rwandan credit units (160 credits for taught modules and 80 credits for the final research project) during a regular study duration of two years. One Rwandan credit corresponds to about 10 hours of workload, which is confirmed by the different stakeholders during the on-site visit. The experts must therefore assume that there is about a factor of three less workload per credit as compared to European (engineering and/or economy) master's programs, where an ECTS credit corresponds to 25-30 hours of workload according to the ECTS users' guide. The experts emphasize that according to the European standard as determined in the ECTS users' guide, each full-time master's degree must comprise at least 1500 hours of workload per academic year. They therefore urge the ACE-ESD to increase the workload of all three master's degree programs accordingly.

The doctoral degrees by research are awarded after the student has successfully completed a study program of 360 credits that comprise the doctoral research thesis and the defense (final presentation of the research work). Next to their individual research, the PhD students have to take postgraduate modules related to their proposal if needed after consultation with the main supervisor or co-supervisor. They should also successfully complete a research methodology course. The experts agree that the overall workload for the PhD programs is realistic.

Criterion 1.6 Didactic and Teaching Methodology

Evidence:

- Module descriptions per program
- Self-assessment report

- Discussions during the on-site visit

Preliminary assessment and analysis of the experts:
According to the information provided in the self-assessment report, there is a wide range of different teaching methodologies in all six programs. While the teaching is module-based in the three master's programs, the PhD programs follow a research-based teaching methodology. The master's programs are supposed to integrate and flexibly choose from a wide range of teaching methods, such as lectures, seminars, student presentations and discussions, interactive computer based exercises. However, the module descriptions do not contain information about the teaching methodology, which is why the experts discuss in detail with the program coordinators and staff members how they select the different methodologies for achieving specific learning outcomes, and how the scientific background correlates with the chosen methodology. Yet, it remains unclear on what basis different teaching methodologies are chosen, and who takes on the responsibility to do so. The experts therefore urge the ACE-ESD to ensure that teaching methodologies are chosen based on the learning objectives to be achieved.

The experts also point out that apparently not all members of the teaching staff, especially in the master's programs, possess the required skills and abilities to apply all required methods to train master's students in scientific work. The reason is that there is not a single full professor in these programs (cf. criterion 3.1).

Final assessment of the experts after the comment of the Higher Education Institution regarding criterion 1:

In its statement, the ACE-ESD asks the expert panel to clarify the doubts regarding the scientific level (pp. 7-9) and to indicate concrete examples of modules that are considered to not being appropriate for the respective qualification level. The experts clarify that in the master programs' module handbooks, one finds a somewhat confusing structure of 'objectives', 'skills' and 'learning outcomes'. For instance, there is typically an encoding of what is called 'Learning objectives covered' (A1, A2 etc.). However, looking at the first pages of the documents to understand what theses codes refer to, one realizes that the alleged 'objectives' are labelled 'learning outcomes'. However, 'learning outcomes' and 'objectives' are clearly to be distinguished from each other, since they address different notions. Correspondingly, the documents addressing allegedly the 'objectives and learning outcomes' of the three PhD programs do not contain the notion of an 'objective' at all. They are rather almost identical to each other except for certain notions on contents of the respective programs. Instead, the objectives should be substantially different in terms of the considered contents of the programs.

Concerning the missing EQF level 8, there is apparently a far too little number of full professors with corresponding expertise in the numerous topics to be addressed in the three areas EEC, PSE and REE.

The missing level is explained here in the context of the PSE program specification. It says that the research areas cover ‘power system dynamics, power electronics for renewable energy, generation, transmission and distribution systems, control systems (stochastic systems, stability analysis, system identification), industrial controls, and optimization, smart & micro-grid system, grid connected inverter optimization, off-grid connected inverter design, testing and control, grid-connected multilevel inverter design and electrical vehicles’. While these topics are somewhat classical and rather addressing items from about 10 years ago, advanced topics like artificial intelligence in energy system modelling approaches, intelligent embedded systems, (distributed) functional safety and the internet, integrated energy systems, optimization and other advanced topics are not addressed at all. Similar comments do hold for the other two programs.

<u>Examples of modules lacking scientific level:</u>

-The basis of any scientific treatment of renewable energy systems, power systems and energy economics these days is based on advanced applied mathematical models including, in particular, constrained optimization, stochastic processes and artificial intelligence/machine learning, to name a few. None of the aforementioned topics can be found in either master or PhD level module handbooks.

-Concerning software approaches, one is clearly missing standard schemes like, e.g., multi-agent and distributed control approaches.

-In the whole ‘Msc in Renewable Energy’ module handbook, there is not a single mentioning of the notion ‘software’. Since all state-of-the-art embedded systems including renewable energy systems are running completely on embedded software, though, there is a substantial and equally essential part missing.

-Indeed, many MSc modules contain undergraduate contents. For instance, the module PSE 6361 in the MSc in Electrical Power Systems programs treats ‘Transducers and Acquisition systems’, ‘Discrete transforms’ and ‘Basic Power systems Signal Processing’, which is usually being taught in Bachelor programs in Electrical Engineering.

Regarding the <u>missing software tools and SCADA approaches in the curricula (page 9)</u>, the ACE-ESD explains the following in its statement: “The centre is endowed with high e-tech smart grid laboratory to support respective modules’ intended learning outcomes and Research activities at PhD and master levels. Laboratory practical sessions focus mainly on the following: Small wind power plant (off-grid system) with storage with Supervisory, Control, and Data Acquisition (SCADA) Viewer software package. Industry photovoltaics with 3 phase's synchronization with SCADA Viewer software package. Micro grid system with synchronization with SCADA Viewer software package. Wind power plant with 3 phases synchronization with SCADA Viewer software package and Doubly Fed Induction Generator (DFIG) Smart grid distribution with double bus bar with SCADA Viewer software package Hydropower with pumping and classical power generation with SCADA Viewer software package with multi-function relay. Advanced photovoltaic with one phase synchronization with SCADA Viewer software package. Energy management and gender in energy with SCADA Viewer software package. High voltage transformers with SCADA Viewer software package. Battery storage systems in smart grids with SCADA Viewer software package. Power electronics for renewable energy with SCADA Viewer software package. High voltage transmission 3 phases HVDC with SCADA Viewer software package."

The experts thank the Center for the further explanations but point out that concerning constrained optimization (including mixed-integer programmes, chance constraints, game theory and alike) which is being applied to almost all today's power systems on a data-based approach, it is not taught in the program. A rough estimate of master thesis projects in related programs on power system engineering in Europe says that about 80 percent of system designs and analyses deal with constrained optimization, even in modelling approaches. The reason is the complexity of the systems, which are modelled rather in data-based than parametric and/or analytic approaches, respectively. Concerning SCADA: The comment does not question the availability of SCADA at the university, but the missing exposure of students to contents treating the SCADA approach. This does not only refer to the software itself, but also to requirements for the proper use of it in analysis and design, e.g., of power systems.

Concerning the insufficiency of the scientific methods (page 10), the ACE-ESD asks the experts to validate this with evidence.

The experts clarify that:

- In the master programs, there is a module on 'research methodology' being taught in the 2nd semester and comprising 10 credits. It claims to achieve, among others, the learning outcomes C5. Validate Software development /Management strategies based on the requirements specification and D7. Use all kinds of hardware and software tools appropriate for ICT and research. In view of the missing software contents, though, it is hard to imagine how these learning outcomes are to be achieved.

- Apart from fact that MATLAB is not a sole simulation tool (as claimed twice in the module handbook), there is apparently no class teaching students the analysis and representation of data using, e.g., MATLAB. This would require an in-depth familiarization with the different MATLAB toolboxes, their co-operation with C-programming and eventually with SIMULINK. It is understood that MATLAB licenses will potentially cause non-negligible expenses. Therefore, a public-domain software environment might be an alternative.

- Similarly, no course is available on LaTeX. Furthermore, students do not seem to be introduced in scientific publishing which is a prerequisite to do a thesis project being oriented towards publishing the results.

After assessing the statement of the university, the experts do not consider this criterion to be fulfilled.

2. Exams: System, Concept and Organization

Criterion 2 Exams: System, concept and organization

Evidence:

- General academic regulations for postgraduate studies
- Module descriptions per program
- Sample exams provided during the on-site visit
- Self-assessment report
- Discussions during the on-site visit

Preliminary assessment and analysis of the experts:

At the ACE-ESD, assessment is conducted according to the regulations defined in the general academic regulations for postgraduate studies. The assessment system has two purposes: a formative and a summative purpose. The formative assessments are used by the lecturer to continuously monitor the progress of achieving the course objectives and take place in the middle of or throughout the semester. Continuous assessments make up 60% of the total grade for a module. Typical forms of continuous assessment are assignments, tests, quizzes, and practical/laboratory work. Students normally receive feedback on their continuous assessment performance before the next assessment within the same module. The summative assessments are used to display whether the course objectives have been met at the end of each semester and consist of a final assignment or exam for completion of a module. The final exam contributes 40% to the total grade of a module.

The experts as well as the students welcome the continuous learning assessment as it not only allows a close monitoring of the students' learning progress but also encourages students' motivation throughout the semester. By helping students to consciously assess their actual state of knowledge, the assessment procedure at the same time contributes to an adequate exam preparation.

The organization of the exams guarantees examinations that avoid delay to students' progressions. The relevant rules for examination and evaluation criteria are transparently put into a legal framework, as both students and lecturers confirm in the audit discussions. All final exams take place within a certain timeframe at the end of each semester. This timeframe is communicated at the beginning of each academic year. The experts confirm that rules have been defined for disability compensation measures, illness and other mitigating circumstances. However, rules for retaking exams (resits) do not exist, and in the different discussion rounds, the experts find that assumptions on if and how often exams may be retaken differ greatly among the different interlocutors. The experts thus ask the ACE-ESD to define binding rules for resits. These must also be anchored in all relevant official documents and regulations.

From discussions with the students and teaching staff, the experts learn that the only form of final examination is the traditional written exam, which is very unusual in postgraduate studies and, more importantly, strongly limits competence-oriented testing. During the discussion with the teaching staff, the experts try to find out on what basis the types of examination (both continuous assessment and final exams) are chosen, but those present are unable to explain this in a convincing and meaningful way. By contrast, the experts assume that forms of examination are either randomly chosen or determined otherwise, and thus lack any reference to the learning outcomes and competencies to be acquired during the respective modules. The experts therefore ask the ACE-ESD to ensure that the forms of examinations enable competence-oriented testing.

During the on-site visit, the experts were provided with a selection of exams and final theses from all study programs under review. The experts note that, as a consequence of the fact that large parts of the curriculum do not correspond to EQF level 7 or EQF level 8, respectively, the requirements and standards of most of the presented exams do not reach master's or doctoral level either. All of the samples presented lack the necessary scientific and research-oriented approach and instead focus mostly on practical application.

Final assessment of the experts after the comment of the Higher Education Institution regarding criterion 2:

In its statement, the ACE-ESD claims that the rules for re-exams and re-sits are anchored in the curriculum. In these documents, it is written that "Students who failed the final examination will be given an opportunity to redo the final examination of failed modules. This opportunity can be given only once in a particular time." Yet, the experts emphasize that this does by no means suffice, as this regulation is anything but clear. For example, it remains completely unclear how often and under what circumstances exams can be retaken.” Moreover, the experts highlight once again that these rules are not transparent either, as none of the students or staff members present during the discussions during the on-site visit were aware of any such rules.

The experts do not consider this criterion to be fulfilled.

3. Resources

Criterion 3.1 Staff and Development

Evidence:

- Staff handbook
- Academic staff development guidelines
- Self-assessment report
- Discussions during the on-site visit

Preliminary assessment and analysis of the experts:

For the implementation of the six programs under review, the ACE-ESD requests teaching staff from the six different colleges of the University of Rwanda. A staff exchange program also allows the ACE-ESD to integrate international teaching staff.

In the self-assessment report, the ACE-ESD provides a detailed overview (table) of all staff members involved in the six programs, including their academic rank and information on the nationality (whether they are national or international staff members). In total, there are 56 staff members involved in the programs, 23 for the three master’s programs and 33 PhD supervisors. 23 of the 56 staff members have been brought in through exchange with international research institutions and partners.

From the table provided and the discussions during the on-site visit, the experts note that the number of full professors in the six programs is extremely low. There is not a single full professor in any of the three master’s programs, which is clearly not in line with the objective to train master’s students in scientific approaches. There is only one associate professor for the Energy Economics master’s, one for the Renewable Energy master’s, and three for the Electrical Power Systems master’s. The number of full professors is also too low in all three PhD programs. To put it precisely, there is not a single full professor in the PhD in Energy Economics, two in the PhD in Renewable Energy and three in the PhD in Electrical

Power Systems. The number of associate professors is similarly low in all three PhD programs (two in Energy Economics, three in Renewable Energy, and three in Electrical Power Systems). All remaining staff members are lecturers or senior lecturers. Although the experts learn that local staff is being promoted within the ACE programs and that the ACE-ESD is planning to increasingly hire highly qualified teaching staff through visiting professorships or by promoting internal staff through an increase in research (e.g. through an incentive system), they expressly point out that the number of (full) professors currently involved in the programs is too low. The number of full professors must be increased as soon as possible in order to guarantee the desired level of quality in all six programs and also to adhere to the standards of the academic level aimed at, i.e. master's and PhD level. This is of particular importance as all six programs – not only the PhD programs – claim to have a strong focus on research. In particular with regards to the PhD programs, it remains unclear to the expert panel on what basis supervisors are chosen and who qualifies to be a PhD supervisor, as the majority of supervisors does not hold a professorship. Thus, in addition to increasing the overall number of full professors, the experts furthermore ask the ACE-ESD to ensure that all PhD supervisors have a sufficient scientific qualification and the necessary experience in order to be able to supervise an ambitious research project.

In order to ensure the continuous further development of its staff members, the University of Rwanda offers different kinds of trainings, courses, workshops, and seminars that are organized on a regular basis and used by the ACE-ESD as well. The college of education offers training courses aiming at the introduction of new teaching methods and pedagogical/didactical approaches in order to improve the quality of teaching. The experts learn that it is required to participate in any such training before a staff member can be promoted. All staff members can also regularly participate in online trainings. Moreover, staff members are increasingly encouraged to participate in (international) scientific conferences. During the discussion with staff members, the experts learn that several staff members are involved in large international projects, and that in the very near future one staff member will spend the first sabbatical at a research institution in Sweden, which the experts highly appreciate. The experts conclude that ACE-ESD is actively promoting and supporting internal knowledge transfer and encouraging its employees to further develop their professional and educational skills.

Criterion 3.2 Funds and equipment

Evidence:

- Tour through the institution and laboratories during the on-site visit
- Self-assessment report
- Discussions during the on-site visit

Preliminary assessment and analysis of the experts:

The University of Rwanda is a public university funded by the Rwandan government and is thus subject to Rwandan administrative law. In addition, the ACE-ESD is benefiting from World Bank funding through the Government of Rwanda soft loan aimed at strengthening selected Eastern and Southern African higher education institutions to deliver high-quality post-graduate education and to build collaborative research capacity in the regional priority areas. The World Bank has provided a total of USD 20 million for all centers of excellence in Rwanda, with USD 5.5 million being allocated to the ACE-ESD for a period of five years (i.e. 1.1 million per year). The experts learn that for each academic year, the director and financial team of the ACE-ESD adopt an action plan which summarized the expenditures and budget planning for the respective period. World Bank funding is mostly spent on scholarships, exchange programs, salaries, travel costs as well as running costs. Local staff working at the center are financed through university budgets.

The ACE-ESD is further sustained by the tuition fees from self-sponsored students (about 5%), students sponsored by the Rwandan Higher Education Council and other Scholarship schemes. The tuition fees for the six programs correspond to the regular tuition fees at the University of Rwanda, which amount to USD 3000 for master’s programs and USD 6000 for PhD programs. No special fees apply for the ACE programs.

During the on-site visit, the experts discuss the financial issues in detail, as they learn that funding by the World Bank will officially terminate at the end of 2023. By the time of the on-site visit, the ACE-ESD (together with the University of Rwanda as a whole) are working on a sustainability plan for the time beyond the World Bank funding. The university convincingly demonstrates how expenditures are prioritized and that funding of the six programs under review will be guaranteed once the World Bank funding has ended and throughout the accreditation period of five years.

During the on-site visit, the experts inspect the different facilities of the faculty, and in particular, the laboratories that are used in the study programs. They notice that the lecture rooms are in good shape and satisfactorily equipped. They also consider the available equipment in the labs to be of adequate standards. The experts are convinced that the laboratories adhere to the international safety standards. In summary, the expert group judges the available funds and the infrastructure adequate for sustaining the degree programs.

Final assessment of the experts after the comment of the Higher Education Institution regarding criterion 3:

In its statement, the Center emphasized that it will work on increasing the number of full professors to adhere to the standards of the academic level aimed at, i.e. master's and PhD level.

The experts thank the Center for this comment and encourage it to work on this continuously.

The experts do not consider this criterion to be fulfilled.

4. Transparency and documentation

Criterion 4.1 Module descriptions

Evidence:

- Module descriptions per program
- Discussions during the on-site visit

Preliminary assessment and analysis of the experts:

The ACE-ESD presents module descriptions for all modules offered in all study programs. However, the experts notice that the module descriptions are in many cases rather unspecific, as in particular the description of the qualification goals and the taught contents is often too short and thus does not give a sufficient overview of the expectations and outcomes of the module. The module descriptions completely lack information on the teaching methodologies, forms of final examination, and admission criteria. Indeed, the module descriptions are nothing but a list of forms (rather than a list of module description tables) which are to serve a double purpose, namely to describe the modules and to be used for administrating the modules upon successful passing them by individual students (as evidenced by the signature fields on the forms).

According to the experts, the module descriptions in their present form are far too wordy and not focused on providing the usually essential information. In addition, there are a lot of typos and unclear formulations.

The experts, therefore, ask the HEI to revise the module descriptions, add the missing content and describe all essential categories precisely so that students as well as external stakeholders can get a detailed overview of the study programs, also on the website. In line with the requested redesigning of the curriculum, the module descriptions must obviously be completely revised and re-written as well.

Criterion 4.2 Diploma and Diploma Supplement

Evidence:

- Sample diploma per program

Preliminary assessment and analysis of the experts:

Upon graduation, students of all degree programs are handed out a diploma. However, to this point the ACE-ESD has not yet introduced Diploma Supplements for its graduates. The experts thus ask the institution to issue Diploma Supplements for the three master's programs that contain the relevant information on the student's qualifications profile and individual performance as well as the classification of the degree program with regard to the Rwandan education system. Moreover, in the Diploma Supplement, the grades of individual modules must be presented and the way in which the final grade is calculated must explained. In addition to the final grade, statistical data as set forth in the ECTS Users' Guide must be included to allow readers to assess the individual mark.

Criterion 4.3 Relevant rules

Evidence:

- General academic regulations for postgraduate studies
- Examination regulations
- Guidelines for the award of the honorary doctoral degrees
- Self-assessment report
- Discussions during the on-site visit

Preliminary assessment and analysis of the experts:

The experts confirm that (except for the rules for retaking exams) the rights and duties of both the university and the students are defined and binding, as they are summarized in the general academic regulations for postgraduate studies of the University of Rwanda. From the documents provided and the discussions during the on-site visit, the experts learn that the university follows a policy of transparent and open rules and regulations.

Final assessment of the experts after the comment of the Higher Education Institution regarding criterion 4:

In its statement, the ACE-ESD indicates that it will consider addressing the comments to give more relevant information on the achievements of the graduates on the students' transcript.

The experts deem this criterion to be partially fulfilled.

5. Quality management: quality assessment and development

Criterion 5 Quality management: quality assessment and development

Evidence:

- Quality assurance policy of the University of Rwanda
- Quality assurance standards of the University of Rwanda
- Handbook for academic quality assurance and enhancement and the maintenance of standards in higher education of the Rwandan Higher Education Council
- Self-assessment report
- Discussions during the on-site visit

Preliminary assessment and analysis of the experts:

According to the self-assessment report, the ACE-ESD has implemented a quality management process to establish and implement methods for monitoring the satisfaction of relevant stakeholders (students, teachers, industry), and, in particular, to evaluate teaching and learning. In this regard, the ACE-ESD relies on the established mechanisms, tools and procedures of the University of Rwanda.

During the on-site visit, the experts discuss the topics related to quality assurance in detail with all stakeholders. While the experts get the impression that the programs under review are subject to internal quality assessment procedures aiming at continuous improvement, they hardly find any binding mechanisms used for this purpose. This becomes particularly apparent during the discussion about the evaluations carried out at ACE-ESD. From the program coordinators and staff members, the experts learn that evaluations take place on a regular basis and always per module. The students, however, claim otherwise and inform the expert group that evaluations do not take place systematically, and by no means on a regular basis. The students are aware of a complaint form that is accessible on the website and can be used by students and other stakeholders at any time in order to file complaints in all different affairs. The experts learn that student feedback is mostly received face to face or directly through a class representative who forwards comments, feedback and suggestions for improvement to the responsible staff member or head of the program. In this context, the students emphasize that the staff members are available at any time and always open for constructive feedback and criticism. The students also highlight that they prefer to reach out to the respective teacher directly and rely heavily on the personal feedback. Although the experts are well aware of the importance of such informal feedback processes, they highly they get the impression that evaluations, as one of the most important mechanisms for a functioning internal quality assurance, do not take place in a systematic and organized way. Moreover, they learn that – if evaluations are carried out – the results are by no means systematically analyzed and are neither discussed with students, nor published. In conclusion, it remains completely unclear how exactly the evaluation results are dealt with, and how – or whether at all – any measures are derived from them.

The experts conclude that the basic elements for an internal quality management system have been laid, at least conceptually. However, as a next – and highly relevant – step, quality assurance must be actively practiced in the everyday life of the ACE-ESD in the future. This means that binding mechanisms must be introduced and, in particular, systematic analyses (both of evaluation results but also with a view to adapting learning objectives and curricula) must be introduced and actually carried out. As a consequence, concrete measures must be derived from the feedback. Concerning the evaluations, this entails that the ACE-ESD ensures a closed feedback loop by sharing and discussing evaluation results with its students and all other stakeholder.

Furthermore, the experts recommend that the ACE-ESD involve also external stakeholders in the process of the continuing development of the programs, in particular representative from industry that are able to analyze and share the needs of the labor market to be reflected in the curricula, as well as during the regular revision processes of the curricula. During the discussion with the industry representatives, the experts learn that they are willing to aid the university in improving their programs but that such a feedback is not systematically asked for. They are very keen on working more closely with the ACE-ESD, especially since the university is supposed to provide a large part of highly qualified engineers in Rwanda and neighboring countries, and expressly wish to be more actively involved in reviewing and developing the programs and in improving quality.

Final assessment of the experts after the comment of the Higher Education Institution regarding criterion 5:

In its statement, the ACE-ESD explains that efforts have been made to collect feedbacks from the students per module. Based on the feedbacks, measures have been taken to improve the academic programs. However, if there are gaps in the process, the Center is committed to improve the quality of the education.

The experts thank the Center for the comment and encourage them to continuously improve the quality processes in order to make sure the above-mentioned deficiencies will be eliminated.

The experts do not consider this criterion to be fulfilled.

D Additional Criteria for Structured Doctoral Programs

Criterion D 1 Research

Evidence:

- Self-assessment report
- Program specifications per program
- Tour through the labs during the on-site visit
- Discussions during the on-site visit

Preliminary assessment and analysis of the experts:

The ACE-ESD claims that the essential requirement of a PhD program is the creation of new knowledge. Thus, the research students are expected to make an original contribution to knowledge (in either theory or applied research) related to the respective discipline by choosing a problem of development priority and finding a solution to it by means of developing new ideas through the creation of new knowledge.

In all doctoral programs, the PhD students are required to follow their independent work plan and submit reports on their progress. The feedback from their supervisors have to be stored to document their personal progress. The students will lead their research project, but will have support from a supervisory team that provide guidance and read and comment on draft work. However, the ACE-ESD emphasizes that the ultimate responsibility for planning and managing the research will rest with the research students themselves.

A key observation of the experts in the targeted advancement of knowledge is the fact that the PhD topics are constrained to address solving the development priorities of the Eastern and Southern Africa Region, through the application of energy technologies. As mentioned under criterion 1.1., the PhD programs address largely (electrical) energy related topics in a regional context rather than in a global one. As mentioned already under criterion 1.1, the experts urge the ACE-ESD to enable the students to not only focus on research topics in a regional context in order to meet the overall criteria of an internationally recognized doctoral degree. The PhD students must be enabled to acquire advanced, cutting-edge knowledge (e.g. by IEEE Xplore Digital Library) and to demonstrate, on the level of *internationally recognized scientific research*, a deep and comprehensive understanding of their research field. Thus, the experts suggest to include research on topics with national, multinational and global relevance in the areas of Renewable Energy, Electrical Power Systems and energy Economics. In addition, it must be ensured that the supervision of PhD students is carried out by full professors whose field of research includes the topic of the doctoral thesis.

Final assessment of the experts after the comment of the Higher Education Institution regarding criterion D 1

The ACE-ESD stresses in its statement that concerted effort will be made to impart the global knowledge to the young people to solve the concrete problem of the region. At the same time, cooperation with international stakeholders to engage with regional and global problems will be strengthened. The experts welcome this approach but stick to their original assessment until concrete measures and improvements can be presented here.

The experts do not consider this criterion to be fulfilled.

Criterion D 2 Duration and Credits

Evidence:

- Self-assessment report
- Program specifications per program
- Module descriptions per program
- Discussions during the on-site visit

Preliminary assessment and analysis of the experts:

The three PhD programs under review have a total of 360 credit points and a regular study time of four (in full time) or six (in part time) years. The doctoral degree by research is awarded only after the student has successfully completed a study program of 360 credits that comprise the doctoral research thesis and the defense (final presentation of the research work). Next to their individual research, the PhD students have to take postgraduate modules related to their proposal if needed after consultation with the main supervisor or co-supervisor. They should also successfully complete a research methodology course.

These modules are non-credited and shall be assessed on a pass/fail basis. The courses taken must be related to the research project of the student and are taught in one of the three master's programs offered at ACE-ESD, respectively.

Final assessment of the experts after the comment of the Higher Education Institution regarding criterion D 2:

The experts consider this criterion to be fulfilled.

Criterion D 3 Soft Skills and Mobility

Evidence:

- Self-assessment report
- Discussions during the on-site visit

Preliminary assessment and analysis of the experts:

The experts highlight that doing a PhD is all about quality, creativity and attraction of a student to a specific topic and that doctoral students should be free in studying and working on a specific topic intensively. The quality assurance cannot be prescribed, it can be, though, supported by actions of supervisors and committees to evaluate what a PhD student provides.

However, the experts are of the opinion that the strict study plan for the three PhD programs under review are constraining the creativity, and making the programs overall conformal with a curriculum in the style of an ordinary master's program. As was discussed already under the criteria 1.1 and 1.3, the PhD programs are lacking doctoral seminars and exchange with other scientists, and thus do not meet the standards of a doctoral degree program on the European level (EQF 8). The fact that students are constrained in choosing their research topic (i.e. the strong focus on regional questions) contributes strongly to that issue and hinders the students to look beyond and conduct research on an internationally recognized level.

As was discussed under criterion 1.3, the PhD programs currently do not offer opportunities for academic mobility and international cooperation within an integrated framework of cooperation between universities and other partners. However, the experts do appreciate that PhD students are encouraged to participate in conferences and that the university covers all expenses.

Final assessment of the experts after the comment of the Higher Education Institution regarding criterion D 3:

In its statement, the ACE-ESD explains that for a PhD student to successfully graduate and be awarded a PhD degree, the Doctoral Committee (DC) has to verify if the student has presented two seminars about his/her research work to the Masters Students and Final

Year undergraduate students in a related field. The Center is convinced that the PhD programs are far above the Masters program. The program involves seminars and exchange programs as well.

The experts thank the ACE-ESD for the comments and clarifications. However, they stick to their above-mentioned assessment as no further explanations or evidence were provided regarding, for example, the seminars and their contents/requirements.

The experts do not consider this criterion to be fulfilled.

Criterion D 4 Supervision and Assessment

Evidence:

- Self-assessment report
- Discussions during the on-site visit

Preliminary assessment and analysis of the experts:

All doctoral students within the programs under review have a main supervisor and a co-supervisor who are, in turn, part of a supervisory team that should not have more than three staff members in total. The supervisory team's main responsibility is to guide the students in their research and personal development. They mentor and guide the student's work during the preparation of the doctoral dissertation, monitor the quality of the student's research work, and shall encourage participation in scientific projects.

The university further has to provide the necessary conditions in order to conduct the intended research at their own or cooperating facilities. The academic supervisors work in close collaboration with the students and provide assistance and advice in the research process. At the end of each semester, the doctoral students have to prepare a report on their process. Furthermore, at the end of the second academic year, the students need to present their progress in front of and take a comprehensive exam by the Doctoral Committee of the ACE-ESD. The university has issued official guidelines and requirements for PhD students. These rules outline the requirements for official doctoral candidature and graduation.

All three doctoral programs are completed upon passing all scheduled exams and completion and defense of the doctoral dissertation.

The experts confirm that a transparent and clear-cut framework of shared responsibilities between doctoral candidates, supervisors and the institution is in place and continuous support by their supervisors is provided. Assessment rules are clearly formulated and binding.

Final assessment of the experts after the comment of the Higher Education Institution regarding criterion D 4:

The experts consider this criterion to be fulfilled.

Criterion D 5 Infrastructure

Evidence:
- Self-assessment report
- Tour through the labs during the on-site visit
- Discussion during the on-site visit

Preliminary assessment and analysis of the experts:
As discussed under criterion 3.2, the experts confirm that overall, the doctoral candidates are provided with an adequate infrastructure and equipment that allows them to appropriately carry out their research projects. Next to the standard labs, doctoral students are supported with special needs to attend international labs in collaboration with ACE-ESD's partners.

One large equipped PhD student resident room is available with a separate desk for each student, a coffee room is available for research students and students working on campus have round-the-clock access to the workspace and ICT facilities. The library facilities with online access are available at any time.

Final assessment of the experts after the comment of the Higher Education Institution regarding criterion D 5:

The experts consider this criterion to be fulfilled.

Criterion D 6 Funding

Evidence:
- Self-assessment report
- Discussion during the on-site visit

Preliminary assessment and analysis of the experts:
The doctoral programs are funded by the total budgets provided by the World Bank. Most of the doctoral students receive a scholarship or any other means of funding, which are again financed by the World Bank. Therefore, conditionally on the latter set-up being available, the experts confirm that the three programs have adequate and sustainable funding.

Final assessment of the experts after the comment of the Higher Education Institution regarding criterion D 6:

The experts consider this criterion to be fulfilled.

Criterion D 7 Quality Assurance

Evidence:
- Self-assessment report
- Discussion during the on-site visit

Preliminary assessment and analysis of the experts:
The ACE-ESD follows the rules and regulations for doctoral studies of the University of Rwanda and the Rwandan Higher Education Council. Admission to doctoral studies is carried out in accordance with the University of Rwanda's general framework and regulations for research degrees. University of Rwanda guarantees that research ethics and rules of good scientific practice are followed.

During their studies, doctoral students have to follow closely the guidelines developed with their supervisors as the study at the ACE-ESD requires a timely and efficient performance.

Since the programs have only started a few years ago, data collections related to individual progression, net research time, completion rate, dissemination of research results, and career tracking do not yet exist. However, the ACE-ESD thoroughly assesses the individual performance and progression of its doctoral students.

Final assessment of the experts after the comment of the Higher Education Institution regarding criterion D 7:

The experts consider this criterion to be fulfilled.

E Additional Documents

Not relevant.

F Summary: Peer recommendations

The peers summarize their analysis and final assessment for the award of the seals as follows:

Degree Program	ASIIN Seal	Maximum duration of accreditation	Subject-specific label
Ma Renewable Energy	Suspension	30.09.2028	–
PhD Renewable Energy	Suspension	30.09.2028	–
Ma Electrical Power Systems	Suspension	30.09.2028	–
PhD Electrical Power Systems	Suspension	30.09.2028	–
Ma Energy Economics	Suspension	30.09.2028	–
PhD Energy Economics	Suspension	30.09.2028	–

Prerequisites, requirements and recommendations for the applied labels

Prerequisites

For all degree programs

V 1. (ASIIN 1.1; 1.3, 2, D1) Increase the scientific level of the programs.

V 2. (ASIIN 3.1) Increase the number of full professors being actively involved in the programs.

For the master's degree programs

V 3. (ASIIN 1.3) The minimum workload of 1500 hours per academic year for a full-time program must be reached.

Requirements

For all degree programs

A 1. (ASIIN 1.3, D3) Establish a framework in order to enable student mobility (structural design of the degree programs, recognition of qualifications, and support services).

A 2. (ASIIN 5) Introduce evaluations and ensure a closed feedback loop.

For the master's degree programs

A 3. (ASIIN 1.4) Define respective rules for the compensation of missing admission requirements.

A 4. (ASIIN 1.6) Ensure that the teaching methodologies are chosen based on the learning objectives to be achieved.

A 5. (ASIIN 2) Define transparent rules for retaking exams which clearly indicate how often and under what circumstances exams can be retaken.

A 6. (ASIIN 2) Ensure that the forms of examinations are chosen based on the learning objectives to be achieved.

A 7. (ASIIN 4.1) Revise the module descriptions and add missing contents as indicated in the report.

A 8. (ASIIN 4.2) Issue Diploma Supplements.

For the PhD programs

A 9. (ASIIN 1.3) Ensure that the rules for the PhD programs enable the students to finalize the program in the foreseen timeframe.

A 10. (ASIIN 1.4) Make the admission requirements for the PhD programs accessible on the website.

A 11. (ASIIN 3.1) Ensure that the PhD supervisors have a sufficient scientific qualification and experience.

Recommendations

For all degree programs

E 1. (ASIIN 1.3) It is recommended to introduce elective courses.

E 2. (ASIIN 5) It is recommended to institutionalize regular exchange with industry representatives.

G Comment of the Technical Committees

Technical Committee 02 – Electrical Engineering/Information Technology (04.09.2023)

Assessment and analysis for the award of the ASIIN seal:

The TC discusses the case and follows the decision of the experts to suspend the study programs under review due to the serious deficits identified by the auditors. They find, however, that precondition V1 is formulated rather generally, which is why they suggest changing the wording to underline that the study programs must achieve EQF level 7 or 8.

The Technical Committee 02 – Electrical Engineering/Information Technology recommends the award of the seals as follows:

Degree Program	ASIIN Seal	Maximum duration of accreditation	Subject-specific label
Ma Renewable Energy	Suspension	30.09.2028	–
PhD Renewable Energy	Suspension	30.09.2028	–
Ma Electrical Power Systems	Suspension	30.09.2028	–
PhD Electrical Power Systems	Suspension	30.09.2028	–
Ma Energy Economics	Suspension	30.09.2028	–
PhD Energy Economics	Suspension	30.09.2028	–

Prerequisites, requirements and recommendations for the applied labels

Prerequisites

For all degree programs

V 1. (ASIIN 1.1; 1.3, 2, D1) Increase the scientific level of the programs to reach EQF 7 and 8, respectively.

V 2. (ASIIN 3.1) Increase the number of full professors being actively involved in the programs.

For the master's degree programs

V 3. (ASIIN 1.3) The minimum workload of 1500 hours per academic year for a full-time program must be reached.

Requirements

For all degree programs

A 1. (ASIIN 1.3, D3) Establish a framework in order to enable student mobility (structural design of the degree programs, recognition of qualifications, and support services).

A 2. (ASIIN 5) Introduce evaluations and ensure a closed feedback loop.

For the master's degree programs

A 3. (ASIIN 1.4) Define respective rules for the compensation of missing admission requirements.

A 4. (ASIIN 1.6) Ensure that the teaching methodologies are chosen based on the learning objectives to be achieved.

A 5. (ASIIN 2) Define transparent rules for retaking exams which clearly indicate how often and under what circumstances exams can be retaken.

A 6. (ASIIN 2) Ensure that the forms of examinations are chosen based on the learning objectives to be achieved.

A 7. (ASIIN 4.1) Revise the module descriptions and add missing contents as indicated in the report.

A 8. (ASIIN 4.2) Issue Diploma Supplements.

For the PhD programs

A 9. (ASIIN 1.3) Ensure that the rules for the PhD programs enable the students to finalize the program in the foreseen timeframe.

A 10. (ASIIN 1.4) Make the admission requirements for the PhD programs accessible on the website.

A 11. (ASIIN 3.1) Ensure that the PhD supervisors have a sufficient scientific qualification and experience.

Recommendations

For all degree programs

E 1. (ASIIN 1.3) It is recommended to introduce elective courses.

E 2. (ASIIN 5) It is recommended to institutionalize regular exchange with industry representatives.

Technical Committee 06 – Engineering and Management, Economics (12.09.2023)

Assessment and analysis for the award of the ASIIN seal:

The Technical Committee discusses the procedure intensively. They add a reference to the internship extending the duration of studies to requirement A9 in order to specify the facts.

The Technical Committee 06 – Engineering and Management, Economics recommends the award of the seals as follows:

Degree Program	ASIIN Seal	Maximum duration of accreditation	Subject-specific label
Ma Energy Economics	Suspension	30.09.2028	–
PhD Energy Economics	Suspension	30.09.2028	–

Prerequisites, requirements and recommendations for the applied labels

Prerequisites

For all degree programs

V 1. (ASIIN 1.1; 1.3, 2, D1) Increase the scientific level of the programs.

V 2. (ASIIN 3.1) Increase the number of full professors being actively involved in the programs.

For the master's degree programs

V 3. (ASIIN 1.3) The minimum workload of 1500 hours per academic year for a full-time program must be reached.

Requirements

For all degree programs

A 1. (ASIIN 1.3, D3) Establish a framework in order to enable student mobility (structural design of the degree programs, recognition of qualifications, and support services).

A 2. (ASIIN 5) Introduce evaluations and ensure a closed feedback loop.

For the master's degree programs

A 3. (ASIIN 1.4) Define respective rules for the compensation of missing admission requirements.

A 4. (ASIIN 1.6) Ensure that the teaching methodologies are chosen based on the learning objectives to be achieved.

A 5. (ASIIN 2) Define transparent rules for retaking exams which clearly indicate how often and under what circumstances exams can be retaken.

A 6. (ASIIN 2) Ensure that the forms of examinations are chosen based on the learning objectives to be achieved.

A 7. (ASIIN 4.1) Revise the module descriptions and add missing contents as indicated in the report.

A 8. (ASIIN 4.2) Issue Diploma Supplements.

For the PhD programs

A 9. (ASIIN 1.3) Ensure that the rules for the PhD programs, especially the mandatory internship, enable the students to finalize the program in the foreseen timeframe.

A 10. (ASIIN 1.4) Make the admission requirements for the PhD programs accessible on the website.

A 11. (ASIIN 3.1) Ensure that the PhD supervisors have a sufficient scientific qualification and experience.

Recommendations

For all degree programs

E 1. (ASIIN 1.3) It is recommended to introduce elective courses.

E 2. (ASIIN 5) It is recommended to institutionalize regular exchange with industry representatives.

H Decision of the Accreditation Commission (22.09.2023)

Assessment and analysis for the award of the ASIIN seal:

The Accreditation Commission discussed the accreditation procedure. They agree with the experts' opinion that the programs under review should be suspended in view of the serious deficiencies found in the curricula and beyond, which underline that the programs do not reach EQF 7 or 8. However, they suggest that the wording of prerequisite V2 should be modified, as the title of full professor has a different meaning worldwide and is determined by a variety of factors, including cultural and political ones. Therefore, the quality of teachers should be measured by their academic qualifications and research activities, not by the title itself.

The Accreditation Commission decides to award the following seals:

Degree Programme	**ASIIN Seal**	**Maximum duration of accreditation**	**Subject-specific label**
Ma Renewable Energy	Suspension	30.09.2028	–
PhD Renewable Energy	Suspension	30.09.2028	–
Ma Electrical Power Systems	Suspension	30.09.2028	–
PhD Electrical Power Systems	Suspension	30.09.2028	–
Ma Energy Economics	Suspension	30.09.2028	–
PhD Energy Economics	Suspension	30.09.2028	–

Prerequisites, requirements and recommendations for the applied labels

For all degree programs

V 1. (ASIIN 1.1; 1.3, 2, D1) Increase the scientific level of the programs to reach EQF 7 and 8, respectively.

V 2. (ASIIN 3.1) Teachers must have sufficient academic qualifications to ensure that the level of teaching in the programs is equivalent to EQF 7 or 8, respectively.

For the master's degree programs

V 3. (ASIIN 1.3) The minimum workload of 1500 hours per academic year for a full-time program must be reached.

Requirements

For all degree programs

A 1. (ASIIN 1.3, D3) Establish a framework in order to enable student mobility (structural design of the degree programs, recognition of qualifications, and support services).

A 2. (ASIIN 5) Introduce evaluations and ensure a closed feedback loop.

For the master's degree programs

A 3. (ASIIN 1.4) Define respective rules for the compensation of missing admission requirements.

A 4. (ASIIN 1.6) Ensure that the teaching methodologies are chosen based on the learning objectives to be achieved.

A 5. (ASIIN 2) Define transparent rules for retaking exams which clearly indicate how often and under what circumstances exams can be retaken.

A 6. (ASIIN 2) Ensure that the forms of examinations are chosen based on the learning objectives to be achieved.

A 7. (ASIIN 4.1) Revise the module descriptions and add missing contents as indicated in the report.

A 8. (ASIIN 4.2) Issue Diploma Supplements.

For the PhD programs

A 9. (ASIIN 1.3) Ensure that the rules for the PhD programs, especially the mandatory internship, enable the students to finalize the program in the foreseen timeframe.

A 10. (ASIIN 1.4) Make the admission requirements for the PhD programs accessible on the website.

A 11. (ASIIN 3.1) Ensure that the PhD supervisors have a sufficient scientific qualification and experience.

Recommendations

For all degree programs

E 1. (ASIIN 1.3) It is recommended to introduce elective courses.

E 2. (ASIIN 5) It is recommended to institutionalize regular exchange with industry representatives.

I Resumption of the procedure

On 10.10.2023, the University received the decision letter indicating the resumption of the accreditation procedure and the deadline for initiating the resumption procedure of 13.01.2025. Despite several e-mails from the ASIIN office reminding the university of the deadline and informing the HEI that it had only one chance to start the resumption process, the university did not submit any documents to initiate the resumption. As a result, the experts and the technical committees involved were not able to carry out a further evaluation of the programmes.

Decision of the Accreditation Commission (25.03.2025)

Assessment and analysis for the award of the ASIIN seal:

The Commission takes into account the fact that, despite several reminders and warnings from the ASIIN office, the University has not submitted any documents to initiate the resumption. As the university was clearly informed of the consequences of not submitting the documents on time, the Commission decides to refuse the degree programmes.

The Accreditation Commission decides to award the following seals:

Degree Programme	ASIIN Seal	Maximum duration of accreditation	Subject-specific label
Ma Renewable Energy	Refusal	/	/
PhD Renewable Energy	Refusal	/	/
Ma Electrical Power Systems	Refusal	/	/
PhD Electrical Power Systems	Refusal	/	/
Ma Energy Economics	Refusal	/	/
PhD Energy Economics	Refusal	/	/

Appendix: Program Learning Outcomes and Curricula

According to the program specification the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Master degree program Electrical Power Systems:

A) Knowledge and understanding

At the end of the program, students should be able to demonstrate knowledge and understanding of the:

A1. Advanced concepts, principles and theories of power system components

A2. Theory of power system operation

A3. Power system protection techniques

A4. Describe and classify power quality issues in a power system

A5. Understand and effectively use standards for quantifying power quality

A6. Analyses of power systems harmonics and transient through multiple methods

A7. Recognize symptoms of power quality deviations or distortions associated with three phase systems

A8. Load forecasting and optimal load scheduling for secure energy supply and use

A9. Working principles of FACTs and HVDC system and AC power transmission improvement by use of FACTs

B) Cognitive/ Intellectual Skills/ Application of Knowledge

At the end of the program, students should be able to:

B1. Identify appropriate methodology to investigate power quality issues

B2. Apply appropriate power quality standards to quantify power quality in systems

B3. Apply skills in investigating power quality issues in distributed systems

B4. Apply acquired skills for power quality systems

B5. Identify and design solutions for power quality improvements

B6. Manage continuous energy supply and use

B7. Apply professional knowledge to operate power system components

B8. Identify types of disturbances that can happen in power system

B9. Mitigate the time and effects of disturbances in power systems

B10. Identify the different types of FACTs and HVDC systems in electrical power systems.

C) Communication/ICT/Numeracy/Analytic Techniques/Practical Skills

At the end of the program, students should be able to:

C1. Apply the appropriate techniques of power quality analysis they have learned to review and critically analyse power quality problems and propose appropriate solutions

C2. Identify and describe the sources of practical power quality issues

C3. Demonstrate an awareness of power quality indices, standards and models in selected case studies

C4. Demonstrate awareness of power quality deviation symptoms and effectively communicate same

C5. Identify and describe, at each time, the running condition of power

C6. Compare available energy supply to load, and take appropriate measures in case of inequality between energy supply and use

C7. Demonstrate an awareness of troubleshooting procedures in power systems

C8. Demonstrate strong technical skills in power protection

C9. Simulate FACTs or HVDC systems with appropriate software

D) General transferable skills

At the end of the program, students should be able to:

D1. Effectively apply their knowledge of power quality in different power systems including distributed systems

D2. Work effectively as a research team member in the implementation power quality improvements

D3. Show sufficient knowledge and understanding the social impact of power quality issues

D4. Balance energy supply end use

D5. Use competently the tools and techniques of protection to short and long time disturbances in power systems

D6. Improve AC transmission and distribution systems

D7. Get enough knowledge of understanding of the use of FACTs or HVDC systems;

D8. Efficiently disseminate scientific research findings within the community and outside, to the research sphere for inter-disciplinary cooperation for increased visibility

The following **curriculum** is presented:

Semester 1					
Module Code	Module	Credits	Contacts hours	Level	Achievement of Programme Outcomes
ENE 6161	Mathematical Analysis and Matrix Theory	10	36	6	A2, A3, A4, A7, A8, A9, B1, B2, B3, C2, C3, D1-D6
ENE 6162	Power and Energy Systems	10	36	6	A1, A2, A4, A5, A6, A7, A8, C1, C2, D1-D6
ENE 6163	Energy Systems modelling and optimization	15	48	6	A1, A2, A3, A4, A5, A6, A7, A8, A9, B1, B2, B3, C1, C2, C3, D1-D6
ENE 6164	Research methodology	10	36	6	A6, A7, A8, A9, A10, A11, B1, B2, B3, B4, B5, B6, C4, C5, D1-D6
ENE 6165	Microeconomics of the energy sector	10	36	6	A4, A5, A6, A7, A10, C3, C4, D1-D6
	Sub-total	55	192	-	

Semester 2					
Module Code	Module	Credits	Contacts hours	Level	Achievement of Programme Outcomes
ENE 6261	Advanced Power Electronics	10	36	6	A1, A2, A3, A4, A6, A7, A8, A9, B1, D1-D6
ENE 6262	Corporate Finance and Business Communication	10	36	6	A4, A5, A6, A7, A10, C4, C5, D1-D6
PSE 6261	Advanced electrical network analysis	15	48	6	A1, A2, A3, A7, A8, C1, C2, D1-D6
PSE 6262	Power systems operation, control and protection	15	48	6	A1, A2, A3, A8, A9, C1, C2, C3, D1-D6
PSE 6263	FACTS and HVDC power systems	15	48	6	A1, A2, A5, A7, A8, C1, C2, D1-D6
	Sub-total	65	216	--	

Semester 3					
Module Code	Module	Credits	Contacts hours	Level	Achievement of Programme Outcomes
PSE 6361	Signal processing for power systems	10	36	6	A1, A2, A3, A4, A5, A6, A7, A8, A9, B1, B2, C1, C2, C3, D1-D6
PSE 6362	Electrical power quality	15	48	6	A1, A2, A3, A7, A8, A9, B1, C2, C3, D1-D6
ENE 6361	Smart-grid systems	15	48	6	A1, A2, A3, A4, A5, A6, A7, A8, A9, B1, B2, B3, C1, C2, C3, D1-D6
PSE 6461	Dissertation	--	--	6	A1-A11, B1-B6, C1-C5, D1-D6
	Sub-total	40	132	-	

Semester 4					
Module Code	Module	Credits	Contacts hours	Level	Achievement of Programme Outcomes
PSE 6461	Dissertation	80	288	6	A1-A11, B1-B6, C1-C5, D1-D6
	Sub-total	**80**	**288**		
	Total	**240**	**828**	-	

According to the program specification the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Master degree program Energy Economics:

A) Knowledge and understanding

At the end of the program, students should be able to:

A1. Carry out technical and economic assessment of off-grid, mini-grid and grid connected power generation systems (i.e. conventional and non-conventional power generation technologies)

A2. Carry out technical and economic assessment of power transmission and generation systems

A3. Develop analytical skills required to apply results of economic analysis in the energy sector, to assist in both policy and regulatory decision making

A4. Understand the basic tools for financial analysis, including basic accounting principles, as well as principles of financial management

A5. Understand the risks associated with the energy sector and be able to apply the risk management tools available to mitigate them

A6. Understand the theoretical and practical perspectives of individual and industrial demand for energy, energy supply, energy markets and carry out energy modelling to determine energy supply and demand.

B) Cognitive/Intellectual skills/Application of Knowledge

At the end of the program, students should be able to:

B1. Apply the knowledge to carry out technical and economic assessment of solar photovoltaic, wind, geothermal, biomass, waste-to-power, Biogas, Micro and pico-hydroelectric power systems, as well as mini and large hydroelectric power systems

B2. Use applied microeconomic models to assist in policy, regulatory and long-term investment decision-making.

B3. Apply knowledge gained to solve the practical issues in the energy sector related to financing of joint ventures, project finance, infrastructure finance, public-private partnerships (PPPs) and privatization

B4. Manage the risks inherent in business transactions in the energy sector

B5. Apply knowledge in developing renewable energy, energy efficiency and climate change policies for controlling emission

B6. Acquire sufficient knowledge and techniques to be able to analyse the relationship between macroeconomic factors and energy sector issues

C) Communication/ICT/Numeracy/Analytic Techniques/Practical Skills

At the end of the program, students should be able to:

C1. Use the analytical techniques and steps involved in carrying out technical evaluation and economic assessment of energy systems

C2. Effectively communicate the results of the analysis to enable policy makers and power system planners

C3. Use empirical techniques to explain micro-economic concepts, and how these are used in the energy sector to solve practical problems

C4. Carry out and publish results of financial analysis of energy sector projects and communicate the results to stakeholders

C5. Manage the major risks associated with energy trading and in other energy sectors.

C6. Develop Renewable energy and energy efficiency policies

D) General transferable skills

At the end of the program, students should be able to:

D1. Explain the key analytic steps used in technical and economic evaluation of power system projects

D2. Use the application of the analytical methods to large new projects, smaller rehabilitation/retrofitting projects, and use knowledge to assist in policy analysis

D3. Undertake independent research/problem solving and present the results at international energy conferences, and also publish papers in international journals

D4. Have the skills in identifying the links between theory, policy, and practice

D5. Provide support on project evaluation as well as policy and regulatory advisory services on public-private partnerships (PPPs)

D6. Model energy demand for different end-users including the industrial sector for policy and regulatory decision making

D7. Work with macroeconomic models to produce results which can help to solve practical policy and regulatory problems in the energy sector

The following **curriculum** is presented:

Semester 1					
Module Code	Module	Credits	Contacts hours	Level	Achievement of Programme Outcomes
EEC 6161	Power and Energy Systems	15	48	6	A1-A6,B1-B6,C1-C6, D1-D7
ENE 6165	Microeconomics of the energy sector	15	48	6	A1-A6,B1-B6,C1-C6, D1-D7
EEC 6162	Energy Economics I	20	72	6	A1-A6,B1-B6,C1-C6, D1-D7
EEC 6163	Econometrics I	15	48	6	A1-A6,B1-B6,C1-C6, D1-D7
ENE 6164	Research Methodology	15	48	6	A1-A6, B1-B6, C1-C6, D1-D7
	Sub-total	80	264	-	

Semester 2					
Module Code	Module	Credits	Contacts hours	Level	Achievement of Programme Outcomes
ENE 6262	Corporate Finance and Business Communication	15	48	6	A1-A6, B1-B6, C1-C6, D1-D7
EEC 6261	Risk Management in the Energy Sector	15	48	6	A1-A6,B1-B6,C1-C6, D1-D7
EEC6262	Energy Economics II	20	72	6	A1-A6,B1-B6,C1-C6, D1-D7
EEC 6263	Advance Econometrics	15	48	6	A1-A3,A5,A6, B1-B6,C1-C6, D1-D7
EEC6264	Macroeconomics	15	48	6	A1-A3,A5,A6,B1-B6,C1-C6, D1-D7
	Sub-total	80	264	--	

Semester 3					
Module Code	Module	Credits	Contacts hours	Level	Achievement of Programme Outcomes
EEC6461	Dissertation	-	-	6	A1-A6,B1-B6,C1-C6, D1-D7
	Sub-total	-	-	-	
Semester 4					
Module Code	Module	Credits	Contacts hours	Level	Achievement of Programme Outcomes
EEC6461	Dissertation	80	288	6	A1-A6,B1-B6,C1-C6, D1-D7
	Sub-total	**80**	**288**		
	Total	**240**	**816**	-	

According to the program specification the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Master degree program Renewable Energy:

A) **Knowledge and Understanding**

The program aims to develop the knowledge and understanding in both renewable energy and systems engineering. At the end of the program, students should be able to:

A1. State-of- the-art knowledge in renewable energy technologies, in terms of: the sources, technologies, systems, performance, and applications of all the major types of renewable energy; approaches to the assessment of renewable energy technologies; the processes, equipment, products, and integration opportunities of biomass-based manufacturing.

A2. State-of- the-art knowledge in process systems engineering methods, in the areas of: modelling and simulation of process systems; mathematical optimization and decision making; process systems design.

A3. Knowledge about industrial applications with power electronics, power system dynamic and control theory

A4. Knowledge about design, management and control of future networks with integration of renewable energy.

A5. Knowledge of important aspects of the ESA energy supply systems and interconnected-African power pools, and the international energy situation.

A6. Advanced level of understanding in technical topics of preference, in one or more of the following aspects: process and energy integration, economics of the energy sector, sustainable development, supply chain management.

A7. Specific subject areas and associated research directed towards advanced and emerging technologies, as well as developing an understanding of concepts from a range of areas peripheral to power systems engineering, such as renewable energy sources, power transmission and conventional thermal power plant.

A8. Design as applied to conceptual and system engineering problems.

A9. Codes of practice, standards and quality issues as applicable to a career as a professional engineer, with an awareness of intellectual property issues and of environmental ethical issues within the modern industrial world.

A10. Project management skills appropriate for a career in engineering and an understanding of the application of these skills in a commercial and/or research environment.

A11. The requirement to communicate effectively in both formal report writing and in oral presentations.

B) Cognitive/ Intellectual Skills/ Application of Knowledge

At the end of the program, students should be able to:

B1. Identify and define a power engineering problem that may be unfamiliar and generate practical as well as innovative solutions

B2. Apply appropriate methods to model such solutions and assess the limitations of the method.

B3. Successfully undertake a design or a research project, taking into account of constraints such as time, cost, health and safety as well as environmental issues.

B4. Develop and apply relevant and sound methodologies for analysing the issue, developing solutions, recommendations and logical conclusions, and for evaluating the results of own or other's work

B5. Identify and implement appropriate information and communication technology solutions.

B6. Develop and exercise written and oral communication skills in preparation for a professional engineering career.

C) Communication/ICT/Numeracy/Analytic Techniques/Practical Skills

At the end of the program, students should be able to:

C1. Analytically model the available renewable sources systems using mathematics technics.

C2. Optimally design and select appropriate collection and storage, and optimise and evaluate system design

C3. Apply efficiently generic systems engineering methods such as modelling, simulation, and optimization to facilitate the assessment and development of renewable energy technologies and systems

C4. Work effectively as a member of a small team.

C5. Arrange appropriate work schedules to meet specified deadlines.

D) General transferable skills

At the end of the program, students should be able to demonstrate appropriate skills in the following:

D1. Provision of training in topics representing current state-of-the-art developments in electrical power engineering, including modern approaches to the analysis of properties, dynamics and limitations of power networks, machines and converters, advanced numerical methods in application to: electrical power engineering problems across various scales; power conversion, transmission, distribution and end-use processes; emerging technologies; cross-disciplinary areas.

D2. Appreciation of the significance of the Renewable Energy system in a wider context including its economic and social development aspects.

D3. Provision of training in teamwork, innovation and scientific communication.

D4. Development of skills in the planning and execution of a tailored research project, which would produce original scientific outcomes suitable for publication in a peer reviewed journal.

D5. Fostering of the ability to work autonomously, and critically assess results in the context of the current state-of-the-art within a particular area.

D6. Organizing, planning of work, reporting and essay writing.

The following **curriculum** is presented:

Semester 1					
Module Code	Module	Credits	Contacts hours	Level	Achievement of Programme Outcomes
ENE 6161	Mathematical Analysis and Matrix Theory	10	36	6	A2, A3, A4, A7, A8, A9, B1, B2, B3, C2, C3, D1-D6
ENE 6162	Power and Energy Systems	10	36	6	A1, A2, A4, A5, A6, A7, A8, C1, C2, D1-D6
ENE 6163	Energy Systems modelling and optimization	15	48	6	A1, A2, A3, A4, A5, A6, A7, A8, A9, B1, B2, B3, C1, C2, C3, D1-D6
ENE 6164	Research methodology	10	36	6	A6, A7, A8, A9, A10, A11, B1, B2, B3, B4, B5, B6, C4, C5, D1-D6
ENE 6165	Microeconomics of the energy sector	10	36	6	A4, A5, A6, A7, A10, C3, C4, D1-D6
	Sub-total	55	192	-	

Semester 2					
Module Code	Module	Credits	Contacts hours	Level	Achievement of Programme Outcomes
ENE 6261	Advanced Power Electronics	10	36	6	A1, A2, A3, A4, A6, A7, A8, A9, B1, D1-D6
ENE 6262	Corporate Finance and Business Communication	10	36	6	A4, A5, A6, A7, A10, C4, C5, D1-D6
REE 6261	Thermal Energy and Bioenergy	15	48	6	A1, A2, A3, A7, A8, C1, C2, D1-D6
REE 6262	Fluid Dynamics and Hydropower	15	48	6	A1, A2, A3, A8, A9, C1, C2, C3, D1-D6
REE 6263	Wind and Solar Energy	15	48	6	A1, A2, A5, A7, A8, C1, C2, D1-D6
	Sub-total	65	216	--	

Semester 3					
Module Code	Module	Credits	Contacts hours	Level	Achievement of Programme Outcomes
REE 6361	Renewable Energy Integration	10	36	6	A1, A2, A3, A4, A5, A6, A7, A8, A9, B1, B2, C1, C2, C3, D1-D6
REE 6362	Power Systems Dynamics	15	48	6	A1, A2, A3, A7, A8, A9, B1, C2, C3, D1-D6
ENE 6361	Smart-grid systems	15	48	6	A1, A2, A3, A4, A5, A6, A7, A8, A9, B1, B2, B3, C1, C2, C3, D1-D6
REE 6461	Dissertation	-	-	6	A1-A11, B1-B6, C1-C5, D1-D6
	Sub-total	40	132	-	

Semester 4					
Module Code	Module	Credits	Contacts hours	Level	Achievement of Programme Outcomes
REE 6461	Dissertation	80	288	6	A1-A11, B1-B6, C1-C5, D1-D6
	Sub-total	**80**	**288**		
	Total	**240**	**828**	-	

According to the program specification the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the PhD program Electrical Power Systems:

A) Knowledge and Understanding

At the end of the program, students should be able to:

A1. Critically examine the background literature relevant to the electrical power systems field;

A2. Develop skills in making and testing hypotheses, in developing new theories, and in planning and conducting experiments in electrical power systems field;

A3. Develop or design electrical power systems solutions;

A4. Formulate Mathematical methods connected to electrical power systems and their impact on the theory of algorithms.

B) Cognitive/ Intellectual Skills/ Application of Knowledge

At the end of the program, students should be able to:

B1. Engineer in electrical power systems by applying state-of-the-art of energy technologies and validation techniques in conjunction with simulation and experimental methodology;

B2. Review research work within electrical power systems domain; relate it to the forefront of knowledge, and assess its applicability for energy solutions;

B3. Perform research that challenges established concepts, theory, methods and technology within the electrical power systems field;

B4. Handle relevant ethical issues pertinent to electrical power systems research and its application on smart grid, grid connected or off-grid solutions.

C) Communication/ICT/Numeracy/Analytic Techniques/Practical Skills

At the end of the program, students should be able to:

C1. Develop practical research skills and learn new state of the art techniques used Electrical power systems research;

C2. Carry out research work of high international standards that advances the forefront of knowledge and application related to electrical power systems within area of smart grid, grid connected or off-grid techniques;

C3. Identify and assess the need for innovation, and initiate and contribute to innovative Electrical power systems projects that can be applied to the society;

C4. Critically analyze complex electrical power systems and give a specific problem based solutions;

C5. Use software development environment to simulate electrical power energy systems solutions.

D) General transferable skills

At the end of the program, students should be able to:

D1. Disseminate and publish research results through recognized channels, including scientific workshops, conferences, and journals within electrical power systems field.

D2. Participate in research discussions and research collaboration internationally on scientific topics within the electrical power energy systems field of specialization.

D3. Efficiently disseminate scientific research findings within the community and outside, to the research sphere for inter-disciplinary cooperation for increased visibility.

D4. Communicate scientific research outputs among the relevant stakeholders and Electrical power energy systems research community;

D5. Contribute to the development of scientific knowledge, scientific methods, and electrical power energy systems based technologies and their application in society.

According to the program specification the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the PhD program Energy Economics:

A) Knowledge and Understanding

At the end of the program, students should be able to:

A1. Critically examine the background literature relevant to the energy economics field;

A2. Develop skills in making and testing hypotheses, in developing new theories, and in Planning and simulation energy economics solutions;

A3. Carry out technical and economic assessment of off-grid, mini-grid and grid connected power generation systems (i.e. conventional and non-conventional power generation technologies);

A4. Carry out technical and economic assessment of power transmission and generation systems;

A5. Develop analytical skills required to apply results of economic analysis in the energy sector, to assist in both policy and regulatory decision-making;

A6. Understand the basic tools for financial analysis, including basic accounting principles, as well as principles of financial management;

A7. Understand the risks associated with the energy sector and be able to apply the risk management tools available to mitigate them;

A8. Understand the theoretical and practical perspectives of individual and industrial demand for energy, energy supply, and energy markets and carry out energy modelling to determine energy supply and demand.

B) Cognitive/ Intellectual Skills/ Application of Knowledge

At the end of the program, students should be able to:

B1. Review research work within energy economics systems domain;

B2. Apply the knowledge to carry out technical and economic assessment of solar photovoltaic, wind, geothermal, biomass, waste-to-power, Biogas, Micro and pico-hydroelectric power systems, as well as mini and large hydroelectric power systems;

B3. Use applied microeconomic models to assist in policy, regulatory and long-term investment decision-making;

B4. Apply knowledge gained to solve the practical issues in the energy sector related to financing of joint ventures, project finance, infrastructure finance, public-private partnerships (PPPs) and privatization;

B5. Manage the risks inherent in business transactions in the energy sector

B6. Apply knowledge in developing renewable energy, energy efficiency and climate change policies for controlling emission;

B7. Acquire sufficient knowledge and techniques to be able to analyse the relationship between macroeconomic factors and energy sector issues.

C) Communication/ICT/Numeracy/Analytic Techniques/Practical Skills

At the end of the program, students should be able to:

C1. Develop practical research skills and learn new state of the art techniques used in Energy economics research;

C2. Carry out research work of high international standards that advances the forefront of knowledge and application related to energy economics;

C3. Identify and assess the need for innovation, and initiate and contribute to innovative Energy economics projects that can be applied to the society;

C4. Critically analyze complex electrical power systems and give a specific problem based solutions;

C5. Use software development environment to simulate energy economics systems Solutions;

C6. Use the analytical techniques and steps involved in carrying out technical evaluation and economic assessment of energy systems;

C7. Effectively communicate the results of the analysis to enable policy makers and power system planners;

C8. Use empirical techniques to explain micro-economic concepts, and how these are used in the energy sector to solve practical problems;

C9. Carry out and publish results of financial analysis of energy sector projects and communicate the results to stakeholders;

C10. Manage the major risks associated with energy trading and in other energy sectors;

C11. Develop Renewable energy and energy efficiency policies.

D) General transferable skills

At the end of the program, students should be able to:

D1. Disseminate and publish research results through recognized channels, including scientific workshops, conferences, and journals within energy economics field;

D2. Participate in research discussions and research collaboration internationally on scientific topics within energy economics field of specialization;

D3. Efficiently disseminate scientific research findings within the community and outside, to the research sphere for inter-disciplinary cooperation for increased visibility;

D4. Communicate scientific research outputs among the relevant stakeholders and Energy economics research community;

D5. Contribute to the development of scientific knowledge, scientific methods, and energy economics based methods and their application in society;

D6. Explain the key analytic steps used in technical and economic evaluation of power system projects;

D7. Use the application of the analytical methods to large new projects, smaller rehabilitation/retrofitting projects, and use knowledge to assist in policy analysis;

D8. Undertake independent research/problem solving and present the results at international energy conferences, and also publish papers in international journals;

D9. Have the skills in identifying the links between theory, policy, and practice;

D10. Provide support on project evaluation as well as policy and regulatory advisory services on public-private partnerships (PPPs);

D11. Model energy demand for different end-users including the industrial sector for policy and regulatory decision making;

D12. Work with macroeconomic models to produce results which can help to solve practical policy and regulatory problems in the energy sector

According to the program specification the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the PhD program Renewable Energy:

A) Knowledge and Understanding

At the end of the program, students should be able to:

A1. Critically examine the background literature relevant to the renewable energy field;

A2. Develop skills in making and testing hypotheses, in developing new theories, and in planning and conducting experiments in renewable energy field;

A3. Develop or design renewable energy solutions to remote areas;

A4. Formulate Mathematical methods connected to renewable energy and their impact on the theory of algorithms.

B) Cognitive/ Intellectual Skills/ Application of Knowledge

At the end of the program, students should be able to:

B1. Engineer in renewable energy systems by applying state-of-the-art of energy technologies and validation techniques in conjunction with simulation and experimental methodology;

B2. Review research work within renewable energy domain, relate it to the forefront of knowledge, and assess its applicability for energy solutions;

B3. Perform research that challenges established concepts, theory, methods and technology within the renewable energy systems field;

B4. Handle Relevant ethical issues pertinent to renewable energy systems research and its application on off-grid solutions.

C) Communication/ICT/Numeracy/Analytic Techniques/Practical Skills

At the end of the program, students should be able to:

C1. Develop practical research skills and learn new state of the art techniques used in renewable energy research;

C2. Carry out research work of high international standards that advances the forefront of knowledge and application related to renewable energy within area of off-grid solutions techniques;

C3. Identify and assess the need for innovation, and initiate and contribute to innovative energy projects that involve micro-grid in the society;

C4. Critically analyze complex system like micro-grid or smart grid technologies and give a specific problem based solutions;

C5. Use software development environment to simulate energy systems solutions.

D) General transferable skills

At the end of the program, students should be able to:

D1. Disseminate and publish research results through recognized channels, including scientific workshops, conferences, and journals within renewable energy field.

D2. Participate in research discussions and research collaboration internationally on scientific topics within the renewable energy field of specialization.

D3. Efficiently disseminate scientific research findings within the community and outside, to the research sphere for inter-disciplinary cooperation for increased visibility;

D4. Communicate scientific research outputs among the relevant stakeholders and energy research community;

D5. Contribute to the development of scientific knowledge, scientific methods, and energy based technologies and their application in society

The following **timeline** is presented for all three PhD programs:

S.No.	Category	Index	Section	Year 1		Year 2		Year 3		Year 4	
			Admission Confirmation onwards	*Semester-1*	*Semester-2*	*Semester-3*	*Semester-4*	*Semester-5*	*Semester-6*	*Semester-7*	*Semester-8*
1	**Preliminary Activities**	1.1	Induction week	First week							
		1.2	Initial Proposal presentation & Allocation of Core Graduate modules by **Doctoral Committee**	Third week							
2	**Research Progress Related Activities**	2.1	Core Disciplinary Graduate Module completion -(2)		1 core	1 core					
		2.2	Minor Generic Skills Module - compulsory (2)		1 generic	1 generic					
		2.3	Literature review & Data Collection for PhD Thesis								
		2.4	Comprehensive Exam by **Doctoral Committee** on Extensive Research Proposal & Research Progress at the 4th Semester beginning (REQUIRE a PASS for Doctoral Candidature)				Comprehensive Exam				
		2.5	Continue with PhD Research work								
		2.6	Semester Wise Progress Report Submission (8)- submitted during first week of June and December every year.	1	1	1	1	1	1	1	
		2.7	Presentation of Synopsis at **Doctoral Committee** (during the last three months of 7th semester). APPROVAL GIVEN FOR THESIS WRITING.							PhD Synopsis presentation	
		2.8	Submission of Thesis and Final Viva Voce defense								Final Thesis Defense
3	**Other Mandatory Activities**	3.1	Seminar Presentation at Center/School Level (2)			1 seminar		1 seminar			
		3.2	Workshop attendance (2)					1	1		
		3.3	Conference Paper Publications (1)				MAX time limit				
		3.4	Journal Publications (2)							MAX time limit	
		3.5	Industrial Attachment (3 to 4 months) (1)								
		3.6	UR Research and Innovation week attendance (4)		1 week		1 week		1 week		1 week
		3.7	Graduation								1 DAY