Programme Accreditation
ASIIN Seal
& European Networks (EUR-ACE®, Euro-Inf®, Eurobachelor®, Euromaster®)

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PROGRAMME ACCREDITATION

SELF EVALUATION REPORT FOR PROGRAMME ACCREDITATION

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10/07/2020

- **THE SELF-ASSESSMENT REPORT (SAR) OF THE CAPE PENINSULA UNIVERSITY OF TECHNOLOGY (CPUT) FOR THE MASTER OF ENGINEERING IN ENERGY AS PART OF THE ASIIN ACCREDITATION PROCESS**

ACCREDITATION SUBMISSION

Preamble

The accreditation process is based on a self-assessment report by the applying institution of higher education (CPUT).
The preparation of the self-assessment report offers the opportunity to use internal quality management systems and self-examination processes in order to involve relevant stakeholder groups and to identify possible areas of improvement for the (further) development of a degree programme.
Ideally, the accreditation process will be utilized by the higher education institution as a quality development project and will not be seen as a formal inspection routine.
The self-assessment report is created in two steps:

1. **Self-assessment:** The higher education institution uses the self-assessment report to analyse in an aggregated manner if and how the degree programme/s fulfil/s the accreditation criteria and which particularities have to be taken into account. Variations from the criteria can be explained.
2. There is a special focus on evaluation and assessment rather than on mere description, including, for example strengths and weaknesses, challenges and envisaged solutions.
3. **Evidence:** An annex with evidence includes all internal regulations, documents, quantitative and qualitative data and information, etc., that the higher education institution already has in use, for example where they have been generated by internal quality management processes and must not be produced just for the accreditation process. The evidence must also be numbered and clearly linked to a specific criterion and be listed in a table of content. Please make sure to provide all documents in pdf-compatible format.

- **CPUT Application Data**

General Data

Website of the Higher Education Institution	http://www.cput.ac.za/
Faculty/Department offering the Degree Programme	Faculty of Engineering and the Built Environment / Department of Electrical, Electronic and Computer Engineering

Seals applied for

Name of the degree programme (in original language)	**(Official) English translation of the name**	**Labels applied for [1]**	**Previous accreditation (issuing agency, validity)**	**Involved Technical Committees (TC)[2]** (will be completed by ASIIN)
Master of Engineering in Energy	Master of Engineering in Energy	ASIIN	Council on Higher Education (CHE) Accreditation	TC 02

[1] ASIIN Seal for degree programmes; EUR-ACE® Label: European Label for Engineering Programmes.

[2] TC: Technical Committee for the following subject areas: TC 02 - Electrical Engineering/Information Technology.

- **Characteristics of the Degree Programme**

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 Engineering in Energy	M Eng.(Energy)	Energy	7	Full time	No	4 Semesters	120 ECTS / 180 SAQA credits (explained in section 2.2	2016 Semester 1

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

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- **Self-assessment for the ASIIN-Seal**[4]

  - **1. The Degree Programme: Concept, content and implementation**

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

See Acronyms in Appendix A. Evidence of acronyms/abbreviations can also be found in the faculty handbook/prospectus.

INTRODUCTION

Education in engineering in particular will play a key role in building Africa's future technological innovation. This transition, also driven by globalisation, industry and employability, calls for an interdisciplinary approach and the ability to integrate theory with practice. As global energy resources come under pressure, engineers are needed that have a broad and expansive awareness of energy related issues such as energy efficiency, energy management, energy policy, energy access, etc. This qualification will aim to address the current shortfall in this arena. For Africa, energy access and efficiency, are both a prerequisite for reaching the Sustainable Development Goals of attaining affordable and clean energy, sustainable cities and communities, halving poverty, as well as for reducing carbon emissions. To achieve these goals, the qualification focusses on the opportunity of using existing energy resources as efficiently as possible by developing new processes and technologies. As such, the outcomes of this qualification will create a platform for innovation in the Energy Access and Energy Efficiency sector and therefore have a positive impact on socio-economic conditions in Africa. This programme will offer a mix of subject and research options that examine the specific regional energy resources in light of their specific societal needs. It will cover the range from natural to renewable resources with an emphasis on the technologies, processes and standards for efficient energy use and resource management. The programme will deal with the conventional energy production sectors (such as oil, gas and coal), as well as renewable sectors (such as solar, wind and biofuels), and will become a platform for human capital development on standards and policy directives of the participating countries' governments and its agencies.

[4] Includes the assessment for the European subject-specific seals, where applicable. When the accreditation process is finalized, possible requirements and/or recommendations and also deadlines apply to the ASIIN seal as well as to the subject-specific seals.

LEARNING OUTCOMES

The objectives of the Master of Engineering in Energy are as follows:

- to educate and train researchers who can contribute to the development of knowledge in the energy sphere at an advanced level.
- to enable graduates to apply integrated technical knowledge, advanced skills and advanced analysis and problem solving to a particular specialisation in the field of Energy, through involvement in an applied research project.
- to develop the capacity to conduct research, and be able to reflect critically on theory and its application.
- to deal with complex issues both systematically and creatively.
- to critically appraise research and make sound judgments based on data and available information, and to make their conclusions on their findings.
- to continue advancing their knowledge and skills within the profession.
- to create a critical awareness of the socio-economic and environmental implications of various technological solutions in the energy field, as well as the ethical considerations associated with these.
- to develop capacity in the area of project management, risk management and energy management.
- to impart the necessary transversal skills such as technical writing, creative and critical thinking, oral presentation skills, time management, leadership skills, adaptability, working effectively in multidisciplinary teams and effective communication.
- To develop skills that are responsive to society such as social justice, affirmative ethics, social responsibility, tolerance and emotional intelligence.

This qualification demands a high level of theoretical engagement and intellectual independence and will meet the minimum entry requirement for admission to a Doctoral Degree at NQF level 10.

See attached Appendix B depicting the NQF levels.

Learning Outcomes:

The learning process should enable Master Degree graduates to demonstrate:

- LO1: knowledge and understanding of the different alternative and sustainable energy technologies.
- LO2: knowledge and understanding of various mathematical models to solve energy related problems.
- LO3: in depth knowledge and a comprehensive understanding of the renewable energy technologies applicable to the African continent.

- LO4: a critical awareness of the different alternative and sustainable energy technologies regarding generation, transmission & distribution of energy
- LO5: ability to undertake the complex analysis of renewable energy projects.
- LO6: ability to undertake energy related research, development and design within industry.
- LO7: knowledge and understanding of the criteria for analysis of renewable energy projects.
- LO8: ability to analyse, design and select energy conversion processes for different applications
- LO9: knowledge and understanding of, and the ability to analyse and compare different concepts of energy efficient technologies
- LO10: ability to plan and conduct energy audits and compile audit reports in buildings and all sectors of industry, according to the IMPV regulation
- LO11: ability to understand and interpret different government energy efficiency policies and energy auditing regulations.
- LO12: ability to select and use specialised software competently for the design/development and analysis/evaluation of different energy technologies.
- LO13: knowledge and understanding of the modelling of energy related processes with research and industry applied software.
- LO14: ability to model various energy technology related processes and machines
- LO15: knowledge and understanding of existing energy models and simulations and their application to industrial energy related problems.
- LO16: a critical approach to theories, techniques and methods in renewable energy projects as well as critical and creative thinking in solving energy related problems.
- LO17: knowledge and understanding of theories as well as the practical skills and project management skills necessary for the implementation, operation and management of renewable energy systems. This includes the ability to work effectively in interdisciplinary teams or groups within organizations or communities.
- LO18: ability to use diverse methods to effectively communicate conclusions and recommendations relating to projects and investigations undertaken in the energy sector.
- LO19: in depth knowledge and a comprehensive understanding of energy access in Africa and developing countries.
- LO20: ability to organise and manage one's activities responsibly and effectively, and undertake further study autonomously.
- LO21: an understanding of the world as a set of related systems and an acute awareness of issues relating to social justice, ethics and social responsibility.

The competence profile of the degree programme has been developed as follows:

The curriculation of this new qualification followed the rules, regulations and processes required by Public Universities in South Africa and is aligned with the new Higher Education Qualification sub-Framework (HEQSF) as Gazetted by the South African Department of Higher Education and Training on 2 August 2013. This is a requirement placed on all Higher Education institutions in the attempt to keep the curriculum relevant, updated and benchmarked.

Internally, the curriculation was undertaken according to the guidelines and approval process contained in the CPUT documents (Appendix D). Once internal approval was granted on the viability of a qualification from the university management committee, approval to commence curriculation and formally recognise the qualification was sought externally from the Department of Higher Education and Training. Curriculation at the Master's level then consisted of internal peer discussion involving both academic staff and industry members through the mechanisms of advisory board committee meetings and consultation with curriculum experts. The comparability of the intended qualification was benchmarked against national and international qualifications of a similar nature. The intended curriculum was first internally peer reviewed and approved through the university's academic structures, such as the Faculty Board, Academic Planning Committee and Senate. Thereafter the qualification was subjected to national peer review and approval through the formal process and standards applied by the Higher Education Qualification Committee of the CHE. Once approved by the CHE the qualifications served with the South African Qualifications Authority for approval on conformance to the National Qualification Framework.

The benchmarking exercise showed that the proposed qualification does not overlap with any of the current programmes offered at local universities in the Western Cape. The study also revealed that the proposed qualification is competitive and compares constructively with similar programmes offered internationally.

The Objectives-Module-Matrix of the most relevant Subject-Specific Criteria (SSC) is correlated below in Tables 1 and 2.
The Modules are listed in Table 5 below.

Table 1: Objectives matrix: Learning outcomes mapped against modules

Intended learning outcomes for the programme as a whole (competence profile/*learning outcomes*) - Knowledge - Skills - Competences	**Corresponding module objectives/modules (operationalisation)**
- LO1: knowledge and understanding of the different alternative and sustainable energy technologies.	Alternative & Sustainable Energy Technologies; Wind Energy – Advanced; Bio-Energy Technology; Solar Thermal Systems;
- LO2: knowledge and understanding of various mathematical models to solve energy related problems.	Energy Modelling, Generation, transmission & distribution of energy;
- LO3: in depth knowledge and a comprehensive understanding of the renewable energy technologies applicable to the African continent.	Bio-Energy Technology; Alternative & Sustainable Energy Technologies; Solar Thermal Systems; Wind Energy – Advanced;
- LO4: a critical awareness of the different alternative and sustainable energy technologies regarding generation, transmission & distribution of energy	Generation, transmission & distribution of energy;
- LO5: ability to undertake the complex analysis of renewable energy projects.	Alternative & Sustainable Energy Technologies; Bio-Energy Technology; Solar Thermal Systems; Wind Energy – Advanced;
- LO6: ability to undertake energy related research, development and design within industry.	Generation, transmission & distribution of energy; Energy Auditing;

	Energy Modelling; Green Building Economics and Valuation; Energy Efficiency in Industry/Residential;
- LO7: knowledge and understanding of the criteria for analysis of renewable energy projects.	Alternative & Sustainable Energy Technologies; Bio-Energy Technology; Solar Thermal Systems; Wind Energy – Advanced;
- LO8: ability to analyse, design and select energy conversion processes for different applications	Process Energy Analysis and Integration; Alternative & Sustainable Energy Technologies; Generation, transmission & distribution of energy
- LO9: knowledge and understanding of, and the ability to analyse and compare different concepts of energy efficient technologies	Energy Auditing; Energy Modelling; Energy Efficiency in Industry/Residential; Sustainable Building Services and Energy Efficiency;
- LO10: ability to plan and conduct energy audits and compile audit reports in buildings and all sectors of industry, according to the IMPV regulation	Energy Auditing
- LO11: ability to understand and interpret different government energy efficiency policies and energy auditing regulations.	Energy Auditing; Energy Modelling; Energy Efficiency in Industry/Residential; Sustainable Building Services and Energy Efficiency;
- LO12: ability to select and use specialised software competently for the design/development and analysis/evaluation of different energy technologies.	Energy Modelling; Fossil Fuels and Waste to Energy Technologies; Sustainable Building Services and Energy Efficiency;
- LO13: knowledge and understanding of the modelling of energy related processes with research and industry applied software	Energy Modelling; Energy Auditing;

- LO14: ability to model various energy technology related processes and machines	Energy Modelling; Process Energy Analysis and Integration; Bio-Energy Technology;
- LO15: knowledge and understanding of existing energy models and simulations and their application to industrial energy related problems.	Energy Efficiency in Industry/Residential; Energy Modelling; Energy Auditing;
- LO16: a critical approach to theories, techniques and methods in renewable energy projects.	Alternative & Sustainable Energy Technologies; Bio-Energy Technology; Solar Thermal Systems; Wind Energy – Advanced;
- LO17: knowledge and understanding of theories as well as the practical skills necessary for the implementation, operation and management of renewable energy systems.	Alternative & Sustainable Energy Technologies; Bio-Energy Technology; Wind Energy – Advanced; Solar Thermal Systems;
- LO18: ability to use diverse methods to communicate conclusions and recommendations relating to projects and investigations undertaken in the energy sector.	Fossil Fuels and Waste to Energy Technologies; Alternative & Sustainable Energy Technologies; Energy Efficiency in Industry/Residential; Sustainable Building Services and Energy Efficiency; Energy Access in Africa and Developing Countries; Solar Thermal Systems; Wind Energy – Advanced; Green Building Economics and Valuation;
- LO19: in depth knowledge and a comprehensive understanding of energy access in Africa and developing countries.	Energy Access in Africa and Developing Countries;

- L020: ability to undertake further study autonomously.	Research Methodology V; Dissertation;
- L021: an understanding of the world as a set of related systems and an acute awareness of issues relating to social justice, ethics and social responsibility.	Energy Access in Africa and Developing Countries;

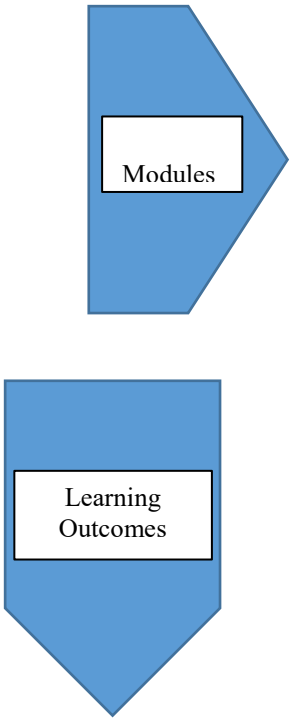
Table 2: Objectives matrix: Module contribution to Learning Outcome-(High (H), Medium (M), Low (L)

Modules	MEng Energy LEARNING OUTCOMES																				
	LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10	LO11	LO12	LO13	LO14	LO15	LO16	LO17	LO18	LO19	LO20	LO21
1.																				M	
2.						H			H		H				H			M			
3.																		M	H		H
4.	H		H		H		H	M								M	M	M			
5.		M		H		M		L													
6.						H			M	H	H		M		M						
7.		H				H			L		L	M	H	H	H						
8.								H						M							
9.	H		H		H		M							L		M	M				
10.												M						M			
11.									H		H	M						M			
12.						L												M			
13.	H		H		H		M									M	M	M			
14.	H		H		H		M									M	M	M			
15.																				H	

(Note: The Module numbers in table 2 coincide with the module numbers in Table 5 below).

Electives

Table 3. Mapping of EURACE Learning Outcomes and MEng (Energy) Module

MEng (Energy)	
15. Dissertation	
14. Solar Thermal Systems	
13. Wind Energy - Advanced	
12. Green Building Economics and Valuation	
11. Sustainable Building Services & Energy Efficiency	
10. Fossil Fuels and Waste Energy Technologies	
9 Bio-Energy Technology	
8. Process Energy Analysis and Integration	
7. Energy Modelling	
6. Energy Auditing	
5. Generation, Transmission & Distribution of Energy	
4. Alternative & Sustainable Energy Technologies	
3. Energy Access in Africa and Developing Country	
2. Energy Efficiency in Industry / Residential	
1. Research Methodology V	

EUR-ACE Learning Outcomes	Knowledge and Understanding		X	X	X		X	X		X		X	X		X	X
	Engineering Analysis		X			X	X	X	X		X			X		X
	Engineering Design			X	X	X	X	X		X		X				X
	Investigations				X				X		X		X	X	X	X
	Engineering Practice		X	X			X	X		X		X		X		X
	Making Judgements					X			X		X		X		X	X
	Communications and Teamwork	X	X	X	X											X
	Lifelong Learning	X														X

Situation analysis and benchmarking exercises were carried out during the development of the programme. Input from industry formed part of this situation analysis (Appendix G). There has been no subsequent follow up to obtain official feedback from industry on the programme. This matter will need to be raised at departmental advisory committee meetings. The programme is flexible since it allows students to choose up to 2 electives in addition to the 4 core modules. The electives chosen by students are dependent on the disciplinary background of the student. It has been observed that only 1 chemical engineering student has enrolled for the program to date, but the student chose electives out of his discipline and consequently none of the chemical engineering electives modules have been offered to date.

Possible Evidence

- Course outlines/subject templates
- Advisory meetings.
- DHET and CHE submissions for new HEQSF qualification approval
- The Objectives-Module-Matrix is presented in Table 3 and Table 4
- The Subject templates are presented in Appendix E

Criterion 1.2 Name of the degree programme

The degree name “Master of Engineering in Energy” reflects the primary focus of the degree programme which is on the broad energy field, in particular energy access, energy efficiency and alternative sources of energy and reflects areas of specialization across the engineering spectrum.

The degree name is in line with the terminology used by experts in the field and corresponds with the nomenclature and naming conventions of the Council on Higher Education. This programme falls within the category Master of “field” (designator: Engineering) with “Energy” serving as the qualifier.

The name is self-explanatory and there have been no misunderstandings or wrong expectations by students or employers regarding the name. The new qualification passed through the institution’s internal approval process where the name was approved at Faculty Management, Faculty Board, Academic Planning Committee, and finally Senate.

Possible Evidence

See attached gazetted Council on Higher Education (CHE) and relevant Higher Education Qualification Sub-Framework (HEQSF) guideline in Appendix K.

Criterion 1.3 Curriculum

The Masters of Engineering in Energy qualification was registered according to the National Qualifications Framework (NQF). It was submitted to the South African Qualifications Authority (SAQA) for registration by the Council on Higher Education (CHE). The qualification has 180 SAQA credits of which a minimum of 120 credits is at NQF Level 9. One credit is equal to ten notional hours of learning (explained

in section 2.2). The qualification consists of a coherent assembly of knowledge areas as defined in the ECSA Qualification Standard E-22-P (See attached Appendix C). The credits are distributed in order to create a coherent progression of learning toward the exit level, according to Table 4.

Table 4: Credits per knowledge areas

Knowledge area	**Minimum credits required (ECSA standard E-22-P)**
Mathematical & Natural Sciences	30
Engineering Sciences	30
Engineering Design & Synthesis	30
Complementary Studies incl. Sustainable Engineering	20
Engineering Research Project	60
For re-allocation	10
Total	**180**

The programme's 180 credits consists of 90 coursework credits and 90 credits allocated to the dissertation. All students complete 6 coursework subjects. Which comprises 4 compulsory subjects and 2 electives. Students undertake all the subjects in year one. Depending on the core engineering discipline of the student (i.e. Electrical Engineering, Mechanical Engineering, Chemical Engineering or Construction Management) the student chooses 2 discipline specific electives. See Table 5. The dissertation is completed in year 2.

Table 5: Curriculum structure with NQF levels and SAQA credits

	Subject name	**NQF level of subject**	**SAQA credits of subject**	**Compulsory or optional (elective)**	**Period of study (Year 1, 2, 3 & 4)**	**Total credits per year**
	Year 1					**90**
1	Research Methodology V	9	15	Compulsory	Year 1	

2	Energy Efficiency in Industry/Residential	9	15	Compulsory	Year 1	
3	Energy Access in Africa and Developing Countries	9	15	Compulsory	Year 1	
4	Alternative & Sustainable Energy Technologies	9	15	Compulsory	Year 1	
5	Generation, transmission & distribution of energy (ElecEng)	9	15	Optional	Year 1	
6	Energy Auditing (ElecEng)	9	15	Optional	Year 1	
7	Energy Modelling (ElecEng)	9	15	Optional	Year 1	
8	Process Energy Analysis and Integration (ChemEng)	9	15	Optional	Year 1	
9	Bio-Energy Technology (ChemEng)	9	15	Optional	Year 1	
10	Fossil Fuels and Waste to Energy Technologies (ChemEng)	9	15	Optional	Year 1	
11	Sustainable Building Services and Energy Efficiency (Construction Management)	9	15	Optional	Year 1	
12	Green Building Economics and Valuation (Construction Management)	9	15	Optional	Year 1	

13	Wind Energy - Advanced (MechEng)	9	15	Optional	Year 1	
14	Solar Thermal Systems (MechEng)	9	15	Optional	Year 1	
	Year 2					
15	Dissertation	9	90	Compulsory	2	**90**

All the subjects offered are linked to Energy Engineering. Each module contributes towards the university's strategic goals, viz.:

- To put in place a full range of relevant and distinctive professionally orientated programmes which conform to national requirements and international standards.
- To affirm our commitment to the concept of Work Integrated Learning and the importance we attach to the employability of our students and ensure that these principles are embedded in our curricula
- To thoroughly harmonize academic standards and practices in the delivery and resourcing of our programmes across all sites

The eight (8) Eurace learning areas were taken into account during the curriculum development process.

Table 3 above shows how the subjects articulate with each of the eight (8) EURACE learning outcomes.
Table 5 above provides the Curriculum structure with NQF levels and SAQA credits

The Department is currently engaged in a systematic process of curriculum evaluation and recurriculation in line with its mission to provide coherent, quality driven academic qualifications compliant with the new HEQSF. Each subject on offer is being closely reviewed by subject lecturers in the first instance and then by the department as a whole. This process is being informed by what other institutions, currently engaged in the same process, are doing. Input from relevant stakeholders was sought by means of a situation analysis.

The subject templates also show the learning outcomes. (See attached Appendix E)

Table 8 presents **the EXIT LEVEL OUTCOMES (**ELOs) with the associated assessment criteria indicating how the assessment will test the knowledge of the outcome required.

Since the qualification has only been recently introduced, no adjustments have been made to date.

Possible Evidence

- Curricular overview/study plan that informs about the student workload for each module in every semester (possibly with location of publication like homepage, student guides, study and examination regulations)
- Objectives-Module-Matrix
- Module descriptions as they are available to students and the teaching staff
- Possibly relevant results from questionnaires/evaluations

Criterion 1.4 Admission requirements

The admission requirement for this programme is one of the following HEQSF aligned NQF level 8 qualifications:

- Bachelor of Engineering;
- Bachelor of Engineering Technology (Honours);
- Postgraduate Diploma.

all in a relevant cognate field of Electrical Engineering, Mechanical Engineering, Chemical Engineering, or related field of study.

The selection criteria for this programme are as follows:

- Only candidates with a minimum of at least 60% average mark in the qualifications identified for admission to this programme will be eligible.
- A minimum requirement is an average of 60% at BTech level for MEng.
- The enrolment plan for this programme is based on the enrolment plan submitted to the Department of Higher Education and Training.

The responsible persons recognize that the (formal and subject-specific) admission requirements promote the achievement of the intended competence profiles by ensuring that each module contributes towards the CPUT strategic goals, as indicated above.

Phase-in and Phase-out dates and admission requirements is contained in Appendix I

The underpinning qualifications enables the participants to cope with the intellectual rigour and demands of the MEng Energy.

Other means of entrance may be pursued, for example through recognition of prior learning (RPL).

Note: RPL is discussed under “Criterion 2.1 Structure and modules”

Students will be given an opportunity to improve their minimum requirement if it is not met. For example, a candidate with a minimum of less than a 60% average required mark could be given a chance to improve their mark at a lower level. Applications are advised of this possibility after scrutiny of their application forms.

Possible Evidence

See Appendix I: Table shows the student the phase-in and phase-out dates and the admission requirements. Further details of the qualification can be obtained at obtained at http://regqs.saqa.org.za/viewQualification.php?id=109659.

2. The Degree Programme: Structures, Methods & Implementation

Criterion 2.1 Structure and modules

The modules have been adapted to the requirements of the degree programme which ensures that each module helps to reach the qualification level and overall intended learning outcomes. The outcomes of various review processes (the subject reviews and programme reviews as explained in section 6), the feedback from industry (primarily through advisory committees) and the comments from internal and external moderators and examiners, are all taken into consideration and help ensure that modules are consistent within themselves, are matched against each other and, where applicable, build upon each other. Any minor changes (comprising less than 50% of the programme) that need to be effected as a result of these processes, can be pursued via an internal procedure requiring faculty board and senate approval.

Each coursework module has an assessment rubric or an evaluation memorandum to ensure that the intended academic level is met. This also applies to the research dissertation. These instruments allow the determination to be made as to whether a student has failed to meet, met or has exceeded the assessment criteria. The coursework component accounts for 50% of the student's final mark. The dissertation accounts for the remaining 50%. Each dissertation is assessed externally. The external examiner is required to adhere to the institution's standard assessment rubric. A sample of this form is attached in Appendix J.

The comparable references for the MEng (Energy) have been primarily the respective exit level indicators of the South African NQF (Appendix B) and the master degree descriptors of the HEQSF (Appendix K).

The ECSA standards for the professional master degree comprise and detail a set of 10 exit level outcomes (as listed in section 1.1 above which are comparable to the EUR-ACE Master programme outcomes. In the ECSA document it is even stated that the MEng professional standard has been intentionally written to meet or exceed the programme outcomes of the EUR-ACE Master (as listed in Table 6).

The exit level outcomes and level descriptors defined in this qualification are aligned with the International Engineering Alliance's Graduate Attributes and Professional Competencies for professional engineers (www.ieagreements.org).

As the master thesis counts for half or at least one third of the master programme credits ECSA has in addition specified the abilities which should be achieved by the dissertation:

-the ability to conduct in depth literature searches;
-the ability to identify, locate and obtain required data;
-the ability to design and conduct analytic, modelling and experimental investigations;
-the ability to critically evaluate data and draw conclusions;
-the ability to investigate the application of new and emerging technologies in their branch of engineering; and
-the ability to report and communicate findings.

Referring to these ECSA outcomes in programme and module design and providing appropriate evidence that they have been achieved upon graduation (though appropriate use of assessment rubrics) would also satisfy the EUR-ACE Master label requirements.

The different electives (as indicated in Table 5) add value for a specific field of expertise within the energy discipline. They promote the achievement of the competence profile for students from different branches of engineering. Students are free to choose any electives since there are no pre-requisite modules for electives. The electives do conform to each of the 4 linked disciplinary areas i.e. chemical, electrical, mechanical engineering and built environment. Students are aware of the required background knowledge expected for each of the electives.

Table 3 maps the Eurace Learning Outcomes to the subjects of this degree programme, including the elective options.

CPUT is a member of an EU funded Edulink consortium Programme on Energy Efficiency in Southern Africa (PEESA) that includes Southern African and European partners. The objectives of the PEESA project are to install advanced curricula at the African partner universities that meet European quality standards for engineering education, to develop a methodology for curriculum design and to develop and implement

a postgraduate Master's degree level engineering programme. Currently CPUT has Memoranda of Understanding with each of the European Universities which support the mobility of students. CPUT also has a Senate approved process which enables subjects completed at other universities to be recognized towards a degree at CPUT provided there is sufficient overlap with corresponding subjects in that degree. As other members of the consortium have also developed Master programmes in Energy, there will be ample opportunities for student mobility among universities in the consortium. The mobility would be best suited for the second year of the programme, which is less structured than the first year. As the programme has only recently commenced, no student mobilities have yet taken place.

Table 6 provides information on registration statistics and graduation rates since the inception of the programme.

Table 6. Student intake and graduations for new programme

Year	New registered students	Student graduations	Students cancelled
2016	15	0	0
2017	24	0	0
2018	21	2	1
2019	15	2	1
2020	34	*	0

* unknown at this stage.

The delay in the intended graduation time is a direct result of the long delay experienced in achieving accreditation for the new MEng in Energy. Universities are not permitted to enrol students for a qualification until the qualification has been registered with SAQA and accredited by the CHE, which could take up to two years. In the interim students were registered for the old MTech Energy qualification (120 credits) which is in the process of being phased out. Most students enrolled for the interim MTech Energy degree with the intention of

graduating with the new qualification. The MEng in Energy qualification was eventually approved by external agencies in 2018. These students then transferred to the new qualification, and completed the additional credits required.

While there are no industry working practice intervals in this programme, students are exposed to practical experience through laboratory experimental work. These practical activities relate to the use of specialised laboratory research equipment. Some of this equipment includes the Chroma solar PV simulator and tester. Here students program various solar cell IV curves and configure solar modules and arrays MPPT. This data is used to formulate microgrids which are either stand-alone or grid configured. The stand-alone solar systems are interfaced to an electronic reconfigurable load. The grid connected systems are routed to inverters and interfaced to a regenerative grid simulator. Students also have the opportunity to gain practical experience on the Chroma battery simulator and tester. Here they are able to test a wide range of battery chemistries which are either off-the shelf or self-manufactured. They are able to test systems from battery cells to commercial battery packs. Students also gain experience in real-time simulation systems such as the OPAL-RT real-time platform. This allows students to design, configure and test hardware-in-the-loop (HIL) and power-hardware-in-the-lop (PHIL) power electronic circuits for renewable energy power systems. Students also have the capability to access the installed 7kWp solar PV rooftop plus battery energy storage system. Here the DC and AC voltage test points are available for measurement and real-time testing. In addition a range of simulation programs are available to students such as Homer Pro Energy used for configuration of least cost renewable energy microgrids and systems. Other software packages include MATLAB/Simulink, DigSilent and eTap.

Credits can be awarded for subject content that is covered elsewhere at a recognised institution. This is verified by the curriculum officer beforehand. CPUT has a Senate approved process to deal with external recognitions and exemptions.

Recognition of Prior Learning (RPL) also provides an opportunity for students to identify their prior learning, have it assessed and formally acknowledged. The process involves the identification, mediation, assessment and acknowledgement of knowledge and skills obtained through informal and non-formal learning. (RPL Policy, Procedure and Application process are attached as Appendix L)

Possible Evidence

- Objectives-Module-Matrix (*refer to criterion 1.1*)
- Module descriptions as are available to students and the teaching staff
- Documents where the courses of studies and their organization are regulated
- Student progression statistics (Appendix N)

- Documents that inform about the effective regulations about (outgoing) mobility, working practice intervals and the recognition of externally acquired credits (https://www.cput.ac.za/study/rpl)
- Possibly statistical data about student (outgoing) mobility and working practice intervals
- Relevant results from internal questionnaires and evaluations

Criterion 2.2 Work load and credits

LEARNING ACTIVITIES:
The % learning time allocated to each type of learning activity is:

- 30% Lectures (face to face, limited interaction or technologically mediated)
- 30% Independent self-study of standard texts and references (study guides, books, journal articles)
- 30% Independent self-study of specially prepared materials (case studies, multimedia, etc)
- 10% Syndicate groups
- No Tutorials
- No Practical workplace experience (experiential learning/workbased learning etc.)

Table 5 gives an indication of how credit points are allocated to modules.

The SAQA credit-rating system rates 10 notional study hours as equivalent to one credit. Credits represent a measure of all the learning activities engaged in by the student and include, among others, contact time, self-study, WIL, assignments, projects and examinations. Master's Degree and Doctoral qualification types assume a 45-week full-time academic year. An average full-time equivalent student is expected to study for a 40-hour week, thus requiring a minimum credit-load of 180 credits per academic year for Master's Degrees and Doctorates. Credit ratings specified on the framework are expressed as minima. Programmes may require credit loads above the minimum but these should not be unrealistic in terms of the relationship of credits to actual study time, given the parameters specified above.

Student workload is rated by means of assessment surveys or questionaries which are also used to determine whether the workload is manageable. Thus far the surveys have been conducted by individual lecturers, and no problems regarding workload have emerged. In future the annual institutional survey administered by the Quality Management Directorate will also be used.

All components of the degree programme are awarded with credits as indicated in Table 5.

Possible Evidence

- Module descriptions as are available to students and the teaching staff
- Documents where the courses of studies and their organization are regulated
- Student progression statistics
- Documents that regulate the awarding of credit points for the whole higher education institution/ the degree programme
- A conversion formula/ table if no ECTS-credits are awarded originally
- Relevant results from internal surveys and evaluations – possibly statistical data about the student workload

.

Criterion 2.3 Teaching methodology

The following teaching methodologies are used: learner-centered methods in addition to interactive and participative methods, inquiry-based learning, flipped classroom, blended learning, audio-visual, group work, etc. Through the various review processes teaching staff and those responsible for the degree programme recognize that didactical instruments and methods promote the achievement of the intended learning outcomes of the degree programme. Representatives of the Centre for Higher Education Development (Fundani CHED) which is responsible for teaching and learning development at the institution, as well as representatives of the Quality Management Directive participate in the review processes.

Teaching staff are able to apply the didactical instruments and methods, since:

- the academic and support staff complement is of sufficient size and seniority for the nature and field of the programme
- the size of the student body is limited to ensure that all activities related to the programme can be carried out effectively.
- the programme is offered by permanent and qualified academics, who all have doctorate degrees and draw on their years of experience in the field to provide course participants a well-rounded understanding of the course material. The course lecturers will also draw on their past and current research and industry projects to provide course participants relevant and topical insights on current and future energy directions.
- all staff have experience in teaching practice and have a number of years in teaching students at a postgraduate level. Some of the staff have postgraduate qualifications in teaching and learning or higher education development (see Table 7).
- Fundani CHED provides a short practical, six month, teaching course (the TDP) which is compulsory for all newly appointed lecturers. This course covers all aspects of teaching and assessment methodologies

Table 7: Staff Qualifications

Full-time or part-time appointment	Name of academic staff member	Qualifications	Number of years of teaching experience	Number of years of industry experience
FT	Prof MTE Khan	DTech: Electrical Eng.	20	13
FT	Prof W. Fritz	DTech: Electrical Eng.	14	12
FT	Dr K. Aboalez	PhD (Elec. Eng.) PhD: Engineering Education (completing)	19	1
FT	Dr M. Adonis	DTech: Electrical Eng.	19	1

		PhD: Engineering Education (completing)		
FT	Dr A. Raji	DTech: Electrical Eng. PGDip in HE T&L PhD: Engineering Education (completing)	15	2
FT	Dr S. Oyekola	PhD (Chem. Eng.)	18	0
FT	Dr E. Simpeh	PhD (Construction Management)	10	6
FT	Dr. K. Kanyarusoke	DEng (Mech. Eng.) HDHET	13	7

Capacity building and staff development are high on the agenda of the University. Didactical knowledge and skills are regularly updated via CPUT's Centre for Innovative Educational Technology (CIET) and The Fundani CHED (https://www.cput.ac.za/services/ciet and https://www.cput.ac.za/services/ciet/training and https://www.cput.ac.za/services/fundani/asd). The University provides opportunities to all staff to upgrade their qualifications, competencies and professional growth through the provision of funds such as research funds (RDG, URF, ConfCom), teaching funds (TDG) and funds from the Learning Development unit. Additional support is offered by the relevant support units such as Fundani, Research Units, E-learning, etc in the form of training sessions, seminars, conferences and workshops. Staff who enroll for higher degrees are financially assisted in their studies and also in reducing their teaching load and other administrative duties. Formal and non-formal training programmes in the form of workshops and seminars are held regularly to improve staff competencies.

The institution offers a range of academic support programmes through the Student Learning Unit of the Fundani CHED and the Centre for Postgraduate Studies (CPGS). These support programmes relevant for students on the Masters programme include:

Training opportunities

The University provides training workshops for students and supervisors through CPGS and the Research Office. These are augmented by further training in the faculty and by monthly seminars for postgraduate students. Students can present their work and receive input from fellow staff and students. The research workshops cover the basics of research, and mastery of key aspects of research such as proposal writing, understanding of research paradigms, literature review, data collection, and application of research methods. The discussion forums enhance the students' communication skills, allow input from other supervisors and lead to improvement in the student's critical thinking and problem solving skills. The University has a formal Research Day where postgraduate students present their work and engage in peer review. In addition, students are encouraged to present their work at national and international conferences and meetings and attend courses in academic writing, statistics and other related research focus areas. See https://www.cput.ac.za/research-technology-and-innovation/postgraduate

Library services

Library services are provided for students and supervisors. Resources may be accessed through the online library research support. The link to this is https://www.cput.ac.za/lib/research-support). Available to supervisors and students are a host of electronic and digital publications, journals, e-books and databases, relevant to all disciplines and which may be accessed through the University website. These include Science Direct, Scopus, EBSCO among others and allow some full text articles and journals to be accessed for free. Mendelay is available as a bibliographic referencing tool for research purposes. Postgraduate students may access the Research Information Support Centre (RISC). This area is a postgraduate study area with formal and relaxed seating, study carrels and tables to provide for the needs of postgraduate students. Additional resources provided by the Library Services for postgraduate studies and researchers include, the Institutional Repository, Electronic Thesis and Dissertations, data repositories (Figshare and media TUM) and a data management planning tool. Advice on where and how to find suitable publications for publishing own research, as well as research metrics, is also included in the website. It is noteworthy that students across faculties rate this enabling platform highly and consider it easy and efficient in accessing resources.

Inter institutional agreements in the Western Cape, such as CALICO/ CHELiN, further increase the availability of resources through inter-library loans. Agreements operate locally, regionally and internationally and can be activated online or through the University website.

Training guides assisting students in information literacy are available through the library's website http://www.cput.ac.za/lib

IT and software provision

Students are able to use computers at both the Library and IT centres and are able to scan documents or images, photocopy, laminate or have documents ring–bound at the printing department. Software packages generally available for statistical analysis include SSPS, STATISTICA, Design-Expert, SAS. Within the department, the following software is available to postgraduate students: Homer Pro, DigSilent, OPAL-RT, LabView, ORCAD and MultiSim. The institution has a full campus license for MATLAB/Simulink, with specific and applicable toolboxes for all the engineering departments attached to this programme. Atlas.ti is provided for qualitative data management and the plagiarism software is Turnitin. A statistician is available through the Centre for Postgraduate Studies for students to consult. It is worth noting that language editing is provided as a service to address language issues.
The facilities at the University are considered to provide for postgraduate students and sufficient expertise is available within the faculty and the department to support the students.

Infrastructure

In terms of infrastructure for the programme, the department has dedicated computer labs reserved for postgraduate students. There are also five dedicated research laboratories reserved for postgraduates. The department has a dedicated renewable energy laboratory. The laboratory houses equipment from industry leader and supplier, Chroma, through their solar PV renewable energy simulators and battery simulator and testing facility. The equipment was purchased through funding from the National Research Foundation (NRF). The equipment was recently installed and it is planned to use the facilty to expose students to applicable renewable energy projects.
In addition, where equipment is not available, students have access to equipment in other faculties through collaborative agreements.

Funding

The Institution and faculties provide a number of opportunities for students to apply for funding to carry out their research. Scholarships are offered by CPUT, the NRF, SA-MRC, Horizon 2020, TWAS, Welcome Trust, and other funding agencies. In addition, the University Research Fund (URF) provides funding for research projects. Staff members who are embarking on doctoral studies are also eligible to apply for funding which will cover all fees.

Collaborations and partnerships

Collaborations and partnerships on the part of staff aid partnership building in the Masters' students and allow parties to exchange ideas, form academic networks and communicate their research. Students engage with local and foreign scholars and encounter different ideas and avenues of support. See https://www.cput.ac.za/research-technology-and-innovation/postgraduate/funding

Possible Evidence

- Documents out of the daily use of the higher education institution that make apparent the existing didactical concept
- Module descriptions as are available to students and the teaching staff
- Relevant results from internal surveys and evaluation

Criterion 2.4 Support and assistance

Besides some of the support programmes listed above, the Student Counselling Unit of the institution offers a range of support services which include:

1) Individual counselling and psychotherapy: The focus of individual counselling and psychotherapy is to assist students with problems of adjusting to campus or residence life, to address personal, emotional, welfare or relationship problems, to address problems associated with a personal crisis or traumatic experience, to address issues associated with negative peer pressure, substance abuse or forms of physical, sexual or emotional abuse that negatively impacts on a student's studies.

2) Career counselling and career planning: The focus of career counselling and career planning is to support students in terms of the choice of career and/or academic programme and to provide support in terms of advanced study options.

3) Skills development and training programmes: The focus of these types of programmes are on managing change and adjustment to campus life, learning and study skills, time management, staying motivated and goal orientated, problem solving and decision making as well as managing stress and exam anxiety.

4) Wellness programmes: CPUT supports the holistic development of students and defines wellness in terms of seven dimensions: physical, environmental, intellectual, spiritual, emotional, social and occupational. Workshops are offered to raise awareness around holistic wellbeing and to develop students across these seven wellness dimensions.

5) Peer helper services: A group of senior students is training to work under the supervision of a student counsellor in assist students with personal problems. These peer helpers are active in organising wellness awareness event on campus and in student residences.

See https://www.cput.ac.za/services/fundani/studentlearning and https://www.cput.ac.za/students/life/development and https://www.cput.ac.za/students/life/counselling.
Thus far there has been no indication from students that certain advice and support services are missed.

Possible Evidence

- Documents out of the daily use of the higher education institution that make apparent the existing advice and support concept
- Relevant results from internal surveys and evaluations (also peculiarities with respect to the effect of possibly existing measures to avoid unequal treatment in the higher education institution)

3. Exams: System, Concept & Organisation

Criterion 3 Exams: System, concept and organisation

For each subject there are 4 assessments to be completed in a semester. Each assessment has a weight of 25%. There are usually 2 assessments per academic term and each assessment is spaced approximately 4 weeks apart. At the start of each subject students are made aware of the number of assessments and their dates which are contained in the subject and course outline. For the dissertation, the institution has clear guidelines on its assessment which is guided by the Higher Degrees Committee (HDC). See postgraduate prospectus and postgraduate guide at https://www.cput.ac.za/research-technology-and-innovation/postgraduate/hdc and https://www.cput.ac.za/research-technology-and-innovation/postgraduate/supervisors

The governance structures that approve and authorise the marks awarded for the qualifications consist of the Faculty Higher Degrees committee, Faculty board, Senate sub-committees of the Higher Degrees Committee (HDC), the Executive committee of Senate and Senate. The institution has an assessment policy and the faculty also has a policy linked to this, which is implemented. There are various ways of assessing the coursework modules of the qualification, such as assignments, open book exams, software simulations and site work. Onsite

assignment in industry is very effective, since each design approach and results differs.

Policies relating to Assessment and Moderation, including the Policy for Postgraduate Education and Research are provided in Appendix M.

The CPUT Assessment policy and Fundani CHED resources on Assessment were consulted in the development of an assessment strategy for the programme. A variety of assessment methods are used including assignments and presentations that will thoroughly test the students' ability to apply their knowledge and understanding in specific renewable energy projects. The assignments and presentation thoroughly test the students' ability to apply these skills, according to the Exit Learning Outcomes of the programme.

The following assessment techniques/tasks are implemented:

- tests, assignments, projects and case studies. The modalities of assessment help students to focus on demonstrating their ability to apply critical thinking skills and solve problems associated with their future occupational/professional contexts.
- The dissertation activities that cover half of the student workload (90 credits)

The subjects are taught in the form of a block spread over a term. This is suited to the delivery of this masters, since almost all the students are working full time in industry. By offering the course work in the form of blocks, the student is able to attend classes after hours. Table 8 summarises the exit-level outcome (ELOs) associated assessment criteria:

Table 8: Exit-Level Outcome (ELOs) Associated Assessment Criteria:

Learning outcome (Type full description) (Stage 1&2)	**Teaching and Learning strategy Include details about the teaching-learning methods that will be adopted in this subject. Consult CPUT Teaching & Learning**	**Assessment Strategy Include details about the assessment strategy (assessment criteria, methods & techniques,**	**Linked to Exit level outcome (full description from ECSA doc)**

	policy and Fundani CHED resources on Teaching & Learning	**etc.) Consult CPUT Assessment policy and Fundani CHED resources on Assessment**	
	(Stage 3&4)	(Stage 3&4)	(Stage 1&2)
Apply and critically evaluate principles, practices and tools for the design/development and analysis/evaluation of renewable energy systems.	Teaching will be through lectures and industrial case studies. Includes individual and group projects and project preparation, and participation in student-led project presentations, and critical reflection. Various methods will enhance the students' thinking skills, including field visits and industrial case studies allowing application of knowledge to real-life scenarios. As a postgraduate programme, this will build on expertise	A variety of assessments including assignments, and presentations that will thoroughly test the students' ability to apply their knowledge and understanding in specific renewable energy projects. The assignments and presentation thoroughly test the students' ability to apply these skills.	● Problem solving ● Application of scientific and engineering knowledge ● Engineering Design ● Research, investigations, experiments and data analysis ● Engineering methods, skills and tools, including information technology ● Sustainability and the impact of engineering activity
Critically analyse the environmental, social and economic impacts of renewable energy projects.			● Application of scientific and engineering knowledge ● Sustainability and the impact of engineering activity
			● Application of scientific and engineering knowledge ● Sustainability and the impact of engineering activity
Assess and critically evaluate tools for the operation/management and			● Problem solving ● Research, investigations, experiments and data analysis

control/monitoring of renewable energy systems.	acquired in BTech and National Diploma courses. It also provides opportunities for professionals with experience of the renewable energy industry to place this expertise in an academic context through industry visits or guest lectures.		● Sustainability and the impact of engineering activity
Plan, conduct and write a research project report in a professional manner within guidelines and document research/field work			● Engineering Design ● Research, investigations, experiments and data analysis ● Engineering methods, skills and tools, including information technology ● Professional and technical communication ● Engineering Professionalism
Select and use specialised software competently for the design/development and analysis/evaluation of specific renewable energy systems.			● Application of scientific and engineering knowledge ● Engineering Design ● Engineering methods, skills and tools, including information technology
Apply and combine technical and non-technical knowledge to analyse and solve practical engineering problems in renewable energy systems			● Problem solving ● Application of scientific and engineering knowledge ● Engineering Design

The existing university reassessment\supplementary exam policy, requires students to produce a certificate from the campus clinic or a medical practitioner to report the illness for a follow-up examination.

There are also policies for physically challenged students during assessment. To date there have been no consequences resulting from the implementation of these policies.

There have been no cases where this specific form of exam management has had negative effects on study progress in the past 3 years of offering the course work.

The assessment criteria and rubrics are listed in each subject guide and made available to students. See Appendix E

Student assignments completed outside the institution are submitted online via Black Board. There are 2 authentication software systems in use, Turnitin and Safe Assign (a Blackboard product). These are available online for quality auditing.

CPUT uses Respondus LockDown Browser for conducting online examinations. LockDown Browser is an example of proctoring software that locks down the testing environment within a learning management system. It is also able to monitor unusual student activity via a webcam. It is used at over 1500 higher educational institutions, and is considered the "gold standard" for securing online exams in classrooms or proctored environments.

LockDown Browser operates as follows:

- Assessments are displayed full-screen and cannot be minimized
- Browser menu and toolbar options are removed, except for Back, Forward, Refresh and Stop
- Prevents access to other applications including messaging, screen-sharing, virtual machines, and remote desktops
- Printing and screen capture functions are disabled
- Copying and pasting anything to or from an assessment is prevented
- Right-click menu options, function keys, keyboard shortcuts and task switching are disabled
- An assessment cannot be exited until the student submits it for grading
- Assessments that are set up for use with LockDown Browser cannot be accessed with other browsers

Possible Evidence

- Module descriptions as are available to students and the teaching staff, also for the final paper
- Exam regulations and student progression (Appendix N)
- Relevant results from internal surveys and evaluations with respect to exam management and the learning outcome orientation of the exams
- Examples of exam schedules (including the date of the exams)
- Statistical data about the progress of studies, e.g. average grade, failure rate, amount of re-sits

.

4. Resources

Criterion 4.1 Staff

The nominated teaching staff carry either professional doctorate or PhD qualifications and are involved in research at their departments or research centres related to energy generation, transmission and distribution and energy efficiency. The capacity in general as well as the staff qualifications is sufficient for the envisaged programme and the planned 30 places for students. The programme is hosted by the Electrical Engineering department. The department has a complement of 14 staff with Doctoral degrees.

Table 7 above. lists the staff members, their qualification, number of years of experience in industry, number of years spent teaching in Higher Education. (CVs of the research supervisors are provided in Appendix O)

Regarding the infrastructure and the lecture room and laboratory facilities CPUT is well prepared to provide satisfactory learning and research environments for the new MEng programme. With the start of the second semester in July 2016 the Electrical Engineering Department concentrated its activities on the Belville Campus and subsequently moved to a completely new building with modern lecture halls, up to date labs and space for research activities. A particular advantage will be the collaboration with the CPUT Energy Institute. Located in a new building on the Belville Campus site together with SARETEC, the South African Renewable Energy Centre, the Energy Institute has for some years contributed research and technology transfer activities and international conferences on topics of sustainable and renewable energy and efficient use of energy and can host and support MEng (Energy) students during their research work. It will in addition be supported and facilitated by collaborations with external companies and institutes. The Electrical department has 3 buildings at its disposal. One of which was newly built and completed in 2015. There are computer laboratories for students within the buildings in addition to the computer labs on campus for general student use. Postgraduate students have their own dedicated laboratories equipped with computers and measuring and test equipment.

As outlined above CPUT also provides up-to-date IT and library facilities, the library on the Bellville Campus is equipped with the relevant online and remote access to scientific Journals in Engineering and Science and other disciplines and access to international databases. Some of the subscriptions the institution has are: IEEE, ScienceDirect, Elsevier, Scopus and ProQuest.

The department applies a workload model, which indicates that there are sufficient staff resources available for this programme. Thus far no concerns have been raised regarding the amount of resources available for teaching, supervision and administration.

Appendix O provides a table of technical and support staff.

If problems were to occur, these would be reported to the Head of Department. If problems cannot be resolved at departmental level, these would then escalate to the Dean of the Faculty and will be addressed at faculty or institutional level. If occurring problems and bottleneck concerns arise during review processes, these would be reflected in quality improvement plans and monitored on a regular basis.

Visiting lecturers on lecturer\research exchange programmes should be experienced and competent in the energy sphere in order to be employed. They also need to be able to apply the assessment policies of CPUT.

Staff are involved in R&D that support the development of the programme (Recent publications can be seen in the CVs of supervisors in in Appendix 0)

Possible Evidence

- Description of the teaching staff (e.g. CVs)

- Document out the daily use of the higher education institution that demonstrates the sufficient amount of teaching resources

The Cape Peninsula University of Technology actively promotes research of an applied nature, believing that a strong research activity is a necessary feature of any institution offering higher education. Students are sensitised to the importance of information and library skills during their first three years of study, introduced to research methodologies in the degree year, and provided with guidance and facilities to undertake independent research for further studies. The focus area of their research is an energy related project. Some of the projects undertaken to date include

- Energy Storage Mechanisms for an African Microgrid
- Smart building energy management system for improved energy efficiency
- Viability of domestic solar PV micro grid systems for South Africa
- DC microgrid planning model
- Hybrid solar pv-wind renewable energy supply for Steenbras water treatment plant
- Optimization of syngas production from gasification of waste plastic using a small scale IR reactor
- Useful energy utilization of integrated solar PV and thermal with storage device
- Electricity theft detection and mitigation in electric Smart Grid
- An energy management system for a hybrid reversible fuel cell super-capacitor in a 100% renewable power system
- A dynamic voltage restorer in an active distribution network
- Integrated energy storage-wind energy conversion system
- Energy management at a South African higher education institution: A case study
- Optimisation of distributed energy resources in a smart grid
- Low cost energy efficient and robust multifunctional smart meter
- An asset tracking control unit with GPRS interface
- Enhancement of power transfer capacity in bipolar HVDC system
- Residential energy efficiency over a persuasive internet of things based feedback
- Power restoration methods in distribution systems
- Integration of a wind turbine into a utility information technology and control system
- Improvement of power systems security by fault currents reduction
- The impact of distributed generation on the electrical protection system.

Criterion 4.2 Staff development

The lecturing staff have to take responsibility for their own academic and didactic development, but the HOD ultimately, provides support with regard to funding, leave approval, etc.

Staff identify needs and opportunities for professional development. There are a number of internal staff development opportunities such as relevant courses and workshops. These are mentioned in section 2.3 above. The CPUT Staff development policy is provided in Appendix Q.

Possible Evidence

- Description of didactical training opportunities (possibly link to the webpage) and of measures that support the teaching staff in its use
- Statistical data about further development opportunities, e.g. research semesters, visiting professorships, seminars, conferences, workshops

Criterion 4.3 Funds and equipment

The institution makes provision for capital expenditure to support academic programmes.
The current infrastructure is updated and lectures take place in a modern building with lecture rooms and labs. There is no need for additional infrastructure. To date neither students nor staff have raised concerns with respect to the provision of equipment and facilities.

Funding has been received from the NRF for the purchase of large specialised research equipment. ESKOM TESP provides funding for small laboratory equipment. Part of the student tuition fees is channelled back to the department and into the program and used for equipment purchase and maintenance.

There is sufficient equipment and facilities to ensure no bottlenecks. The intake is restricted to less than 40 new students per year.

CPUT's DEECE has an extremely good external cooperation with industry and gets their support and feedback in bi-annual advisory board meetings. Masters students also work on assignments onsite in industry.

Possible Evidence

- Cooperation agreements, regulations for internal and external cooperations.
- Documents out the daily use of the higher education institution that describe the equipment and facilities, e.g. laboratory handbooks, inventory lists, financial plans.

5. Transparency and Documentation

Criterion 5.1 Module descriptions

Possible Evidence

- Module description as they are available to students and the teaching staff

The study guide for each subject are provided in Appendix E:

Criterion 5.2 Diploma and Diploma Supplement

The first masters in energy graduation took place at the end of 2018 without any problem. CPUT does not issue a Diploma Supplement, but academic transcripts are made available to students.

Possible Evidence (See attached Appendix R)

- Sample graduation certificate for each degree programme
- Sample Diploma Supplement for each degree programme
- Sample transcript of records for each degree programme

Criterion 5.3 Relevant rules

Domestic and foreign students' rights and duties are explained in the CPUT General Handbook – Staff and Student Rules and Regulations. See Appendix S

All relevant course-related information is available in English and is accessible to all students. Students are made aware of the rules and regulations that govern their postgraduate study at the institution through the coursework module, Research Methodology V. This module orientates the student to the all relevant documentation relating to their postgraduate study. This includes the Higher Degrees Committee (HDC) process, research writing and communication including the research proposal and dissertation orientation and process and procedure. The CPUT General Handbook – Staff and Student Rules and Regulations (See attached Appendix S) provides information on who is responsible for taking decisions about relevant documentation.

Possible Evidence

- Presentation of all relevant regulations with respect to study progress, access, graduation, exams, quality assurance etc., together with information about the level of the binding character
- Link to the place, where the documents are published, e.g. web pages

6. Quality Management: Quality Assessment and Development

Criterion 6 Quality management: quality assessment and development

CPUT Engineering Programmes undergo a systematic internal quality assurance and improvement process. The programme has quality assurance procedures that are consistent with the HEI quality assurance policy. There is a defined and documented procedure for reviewing the programme at regular intervals using all relevant data, including an evaluation of student achievement against the stated programme aims.
Feedback should be obtained in an agreed format from the students on an accredited programme on all taught modules in the programme, to enable the effectiveness of each module to be evaluated. There should be clearly understood arrangements for the day to day management of the programme to resolve any urgent and immediate problems.
Information about all aspects of the programme, including the quality assurance procedures, would be publicly available.

CPUT undertakes regular evaluations of the qualifications on offer, according to the Higher Education Act and the process devised by the Council of Higher Education and it`s sub-committee the Higher Education Quality Council (HEQC). It normally takes place every third year.

The Department has well-established processes for the quality assurance of Teaching and Learning, as described below:

- Approval of all curricula and any amendments by Senate.
- Annual Advisory committee meetings are held where industry has the opportunity to discuss and give input to subject content.

- Internal and external moderators will ensure that the content of teaching and assessment reflects the study guide, for both content and level.
- Every semester a process of marks review takes place where results for individual subjects are analysed and possible corrective steps are investigated. These steps are integrated by the lecturers and also reported to Faculty Management.
- Research and improvements in Teaching and Learning through programmes like first year experience and mentorship support programmes
- Regular evaluations of lecturers by students are undertaken.
- CPUT Self Review Programme for internal quality assurance
- Annual CPUT Qualification Review.

The Head of Department is responsible for staffing, finances and administration of the entire Department and te programme coordinator co-ordinates all subject and curriculum changes, curriculum development, subject weights, programme meetings and submits any proposed programme changes to Senate and Senex for approval, through the Faculty Management structure. All the duties are ably supported by senior members of staff who assist in the process of quality assurance and co-ordination and the processes described above.

The department has a strong link with industry to ensure that graduates are prepared for the needs of industry. This committee is intended to be representative of all sectors of industry, consultants, contractors and government. All amendments to the programme are discussed and approved by the Advisory committee before they are submitted to Senate.

The Faculty's Quality Management model consists of the following elements:

- Internal Departmental audits (Annual)
- External Statutory audits (4-year cycle)
- Review of Strategic Goals (Annual)
- Subject Review (Annual)
- Qualifications Review (Annual)
- SHE internal audits (Annual)
- Advisory Committee recommendations

- Joint Degree Programme specifications

Recommendations from these audits are transformed into quality improvement plans (QIPs), and linked to specific strategic goals and budgets, as depicted in the figure below.

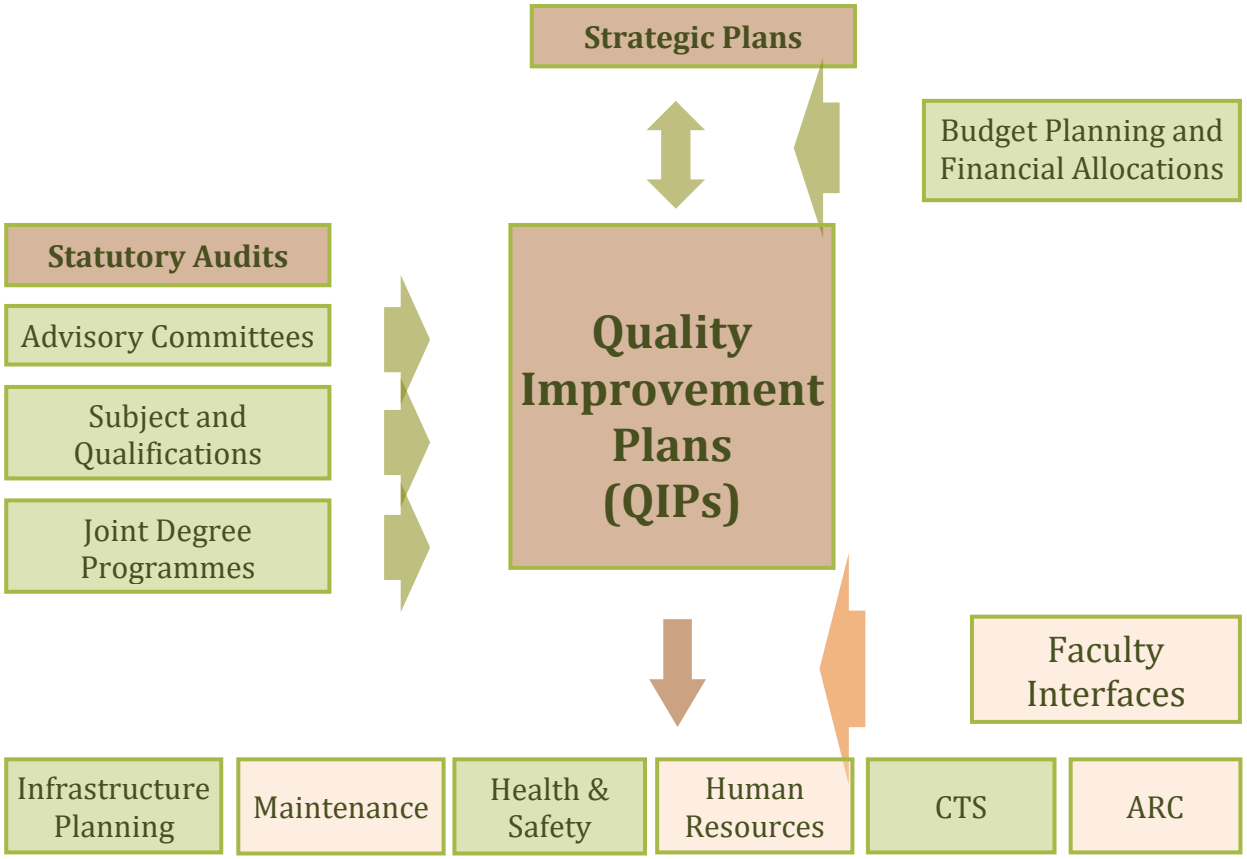


Figure 6.1: Quality Assurance Framework

Annual Audits

Audit teams, consisting of heads of departments and senior staff, conduct four types of audits annually on each department. These audits investigate:

- Facilities and Laboratory Practices:
  This audit aims to determine the extent to which the department's facilities, infrastructure and practices are in accordance with good professional requirements and appropriate legislation. Typical aspects which are reviewed include classrooms, lecture theatres, laboratories, equipment, housekeeping, safety and laboratory reports.

- Academic Documentation:

  This audit consists of a "desk top" paper validation of key administrative and instructional documentation. Typically this audit reviews the availability and comprehensives of relevant policy documents, learner guides, subject files, assessment and moderation practice, policy and reports. Documentation related to work integrated learning and service learning. The Faculty is engaged in a major initiative to digitize all the documentation required for this audit thus enabling it to be conducted remotely and unconstrained by time.

- Research, Review of library resources and Student Development Initiatives:
  This audit formally reviews department activity in the following key areas: Research, departmental quality assurance systems and practices, student development initiatives, etc.

- Departmental Quality Assurance Systems and Departmental documentation.

Self-evaluation of Programmes

Evaluation of the programmes is undertaken as a peer review process and comprises a site visit where panel members interview staff, students and industry members who contribute to the quality of learning received by the students. The review panels consist of 4 to 7 members and include external members from other HEIs, from employers, from Teaching and Learning (Fundani CHED) and the Quality Management Directorate. The Quality Assurance Directorate of CPUT provides comprehensive information about the process and the requirements and is in charge of the organization of the evaluations.

The self-evaluation exercise is conducted on a four yearly cycle. This evaluation is led by the Faculty Management and involves a panel of experts, including an external person, which conducts a full three-day review of the department and its programmes. The panel receives a self-evaluation report from the Departmental Head two weeks prior to conducting the review. Two weeks after the panel has concluded its audit, a report is presented to the Dean with appropriate recommendations and commendation. This report further serves to inform the department's improvement plan.

Departmental Improvement Plans run continually and are updated as new findings arise. They are monitored by the Head of Department and validated externally to the department by the Quality Management Directorate approximately three times a year. Validated improvement plans are discussed with the Dean and the DVC: Teaching and Learning at formal faculty-based meetings and bottlenecks are identified at the departmental, faculty and institutional levels. The regression of closed out improvement actions is also monitored and

Annual Review of Strategic Goals

This review takes place once a year during the first quarter. The review is conducted by the Dean and the Faculty Management and focuses on the extent to which the department accomplished the objectives set in the previous year. The review further identifies impediments which need to be addressed to ensure optimal accomplishment of the set objectives. Based on the outcome of the annual review the Departmental Head and staff will revise the objectives for the year ahead. The departmental strategic plans serve as one of the criteria in the performance agreements between the Dean and HODs.

Subject Review

The Faculty has been conducting subject reviews routinely since 2005. The Senate (2008) approved a Subject Review Process which, to a large extent, is based on the practice in the Faculty of Engineering. Subject reviews serve to identify at-risk subjects along with appropriate types of remedial interventions. The Faculty has, through the subject review process, identified opportunities for generic, cross departmental, teaching and learning interventions as well as staff development opportunities.

Information from the student surveys forms part of the subject review process. The Faculty has pioneered a comprehensive student evaluation mechanism. The student survey of teaching covers a number of dimensions, including: student attendance; homework completion; management of time; punctuality (student and staff); note-taking; access to information; preparation by lecturer; class control; approachability; knowledge of subject; clarity of course content; assessment feedback; fairness of assessment; value of tutorials; library resources; and classroom facilities.

SHE Audits

The Faculty's Health & Safety Committee, which was formerly established in 2012, represented by the Departments through their H&S Officers, consolidated its work during 2013/14, enabling a systematic approach to dealing with H&S non-compliances. The Committee maintains a "Maintenance Register" and an "H&S Protection Services" register, which is available on request.

At CPUT, qualifications are reviewed every 3 years internally, according to the CPUT Programme review policy. Departmental Quality Improvement Plans are drawn up as a result of these reviews. Progress in addressing any shortcomings are regularly monitored at meetings with the Quality Management Director and the Deputy Vice Chancellor to promote continuous improvement. While regular departmental reviews have been undertaken, a formal programme review is yet to be done.

Assessing the level of outcomes at the Advisory Committee meetings, industry input is used for the continuous improvement of the degree programme as well as the structured meetings to validate and monitor progress with the Quality Improvement Plan.

A comprehensive reflection aligned to the national framework considers all aspects of teaching and learning, programme coordination and resourcing. This includes monitoring the attainment of outcomes as part of the normal review process associated with the professional

body, ECSA. A critical reflection process would involve all who contribute to the programme under review and in addition also the students.. The process is supported by a comprehensive range of different sources of information, such as:

- Increase in outputs, subject and qualification review information
- Reports from committees
- Reviews against strategic plans
- Trends analysis in relation to critical outputs
- Evaluation reports
- Impact studies
- User survey/stakeholder feedback Monitoring and tracking procedures and information
- Feedback/ self-evaluation analysis
- Outcomes of processes
- Performance reviews
- Comparative data and teaching and learning research
- Indicators of success, standards, benchmarks, targets
- Examples of success in promoting or enhancing quality
- Major challenges

Students would be required to evaluate this during the annual student evaluation survey conducted by QMD. There would be regular follow up to monitor whether concerns raised by students have been addressed. However, to date surveys have only been conducted by individual lecturers. This is an area that needs improvement.

The aforementioned Programme Review is carried out by QMD, using external partners as panellists and is mentioned above. The DVC T&L meets with HoDs monitor the Quality Improvement plan on a quarterly basis.

Possible Evidence

- Internal regulations about quality management (quality assurance regulation etc.)

- Sample information material about the quality management and its results which the higher education institution regularly uses for its internal and external communication (e.g. link to specific web pages, reports, flyer)
- Quantitative and qualitative statistical data from evaluations, study progression statistics, number of graduates, and their distribution etc.

See Appendix T: Quality Management Policy and Regulations