# QCTO SKILLS PROGRAME APPLICATION FORM

Terms and condition to be satisfied

1. Completed application form in full
2. Pay applicable fee for the processing of this application

Please check the QCTO website for existing skills programmes to prevent duplication. Duplications or skills programmes that are similar to each other will be rejected and the applicant is advised to use the existing skills programme. Historical Unit Standards and Skills programmes that are relevant may be recorded as they are in the new format, provided there is no duplication. Preference will be given to Skills in high demand and programmes that support the South African Economic Reconstruction and Recovery Plan. The following Links may assist in completing this form.

List of qualifications and skills programmes: https://www.qcto.org.za/https://www.saqa.org.za/registration-qualifications-and-part-qualificationsMore about OFO: https://webapps.dhet.gov.za/OFORegisterSAQA published level descriptors: https://www.saqa.org.za/documents/policies-and-criteria/level-descriptors-south-african-national-qualifications-framework

| **SECTION :** | **1. SKILLS PROGRAMME PROPOSER INFORMATION (APPLICANT DETAILS)** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.1 Organisation Name: (X) | **Energy and Water SETA (EWSETA)** | | | | | | | | | |
| 1.2 Type of Organisation: | SETA | CET | TVET | SDP | Public Institution | Employer Organisation | Private Institution | Government Entity | Statutory Professional Body | Professional Body |
| | **X** | | | | | | | | | |
| 1.3 Other : | Specify | | | | | | | | | |
| 1.4 Organisation ID No : | CIPC Registration Number of Institution (Entity) / (LRA Reference Number) if applicable | | | | | | | | | |
| | | | | | | | | | | |
| 1.5 Organisation Physical Address | 22 Wellington Road<br>Parktown<br>2041 | | | | | | | | | |
| 1.6 City: | Johannesburg | | | | | | | | | |

| 1.7 Province (X) | GP | WP | EC | NC | KZN | FS | NW | LP | MP | Non RSA |
|---|---|---|---|---|---|---|---|---|---|---|
| | X | | | | | | | | | |
| 1.8 Organisation Postal Address | PO Box 1273<br>Houghton<br>2141 | | | | | | | | | |
| | | | | | | | | | | |
| 1.9 Name(s): | Lesha | | | Surname: | Singh | | | Title | Ms | |
| 1.10 Email (s) | leshas@ewseta.org.za | | | Contact No: | 011 274 4700 | | | | | |

| | |
|---|---|
| **SECTION :** | **2. SKILLS PROGRAMME DETAILS** |
| 2.1 **Title**<br>(Indicate the name of the skills programme). | Hydrogen Fuel Cell System Technician NQF 5 |
| 2.2 **Subtitle**<br>Indicate the subtitle of the skills programme. Select an occupation to which the skills programme relate.<br><br>Select 1- to 5 Occupation/s that are related to the skills programme. | None |

| | |
|---|---|
| 2.3 **Skills Programme Rationale**<br><br>a) Justification on why the skills programme is needed. | South Africa is highly dependent on fossil fuels – mainly coal – for its electrical energy needs. Coal is a carbon intensive form of energy. Coal-fired power stations contribute innumerable tons of $CO_2$ to the atmosphere. In more recent times, a lot of effort, time and money has been put into exploiting South Africa's abundant energy sources, especially the sun and wind.<br><br>Harnessing and exploiting renewable energy also stems from two very important factors. Firstly, the possibility of decreasing dependence on coal-fired power stations and thereby reducing the concomitant degradation of the environment and, secondly, the recurrent energy generation problems being experienced nationally.<br><br>The rationale for developing a skills programme in Hydrogen Fuel Cell Systems is to build capacity in the operation and maintenance of Hydrogen Fuel Systems.<br><br>Hydrogen fuel cell technology is a new energy generation technology that will generate power without impacting negatively on the environment. It offers maximum efficiency, high reliability, and minimum pollution. It is one of the technologies needed to both generate low carbon emissions, as well as identifying, planning, and implementing the directions for harnessing the potential of renewable energy sources.<br><br>No other courses or qualifications in the development of skills in operational management and maintenance of hydrogen fuel cell systems currently exist in South Africa. |
| b) Indicate titles of similar skills programmes that have been approved by the QCTO, where applicable. | None |
| c) How will the skills programme benefit the sector, society and the economy? | This will benefit the energy sector. The government is giving much more impetus to the renewable energy sector and hydrogen fuel cell technology technicians will find gainful employment. Society will benefit in that the carbon footprint will be reduced. The qualified persons from this course will be able to participate and grow the hydrogen economy – be it in the hydrogen fuel cell manufacturing companies in South Africa. This skills programme is part of the start-up of own hydrogen economy support structure services businesses.<br><br>The skills obtained will enable the successful learner to kick-start hydrogen activities in the promising hydrogen hubs and will boost economic growth. |
| d) Indicate typical learners for this skills programme. | Typical learners will be those already involved in either the hydrogen fuel cell technology, renewable |

| | |
|---|---|
| | energy, energy management or energy efficiency sectors or those wishing to pursue a career in the renewable energy sector and who meet the minimum requirements stated below. Also, typical learners targeted are those who are studying at TVET colleges in the fields of Electrical or Chemical Engineering. |
| e) If the assertion in the skills programme relates to specific occupations or professions:<br><br>i. How will the skills programme meet the requirements for professional registration, membership or licensing as required by recognised professional bodies, and proof of collaboration, if relevant?<br><br>ii. The typical occupations in which the learner who is competent in this skills programme will operate if relevant. | This programme will neither lead to professional registration nor membership of a professional or licensing body.<br><br>This programme is very specific. Acquisition of this skills programme will not authorise the learner to work on any other renewable or non-renewable technology. Also, this is a very brief skills programme. However, the learner will be able to work on sites that employ this technology, like mining, for example. |
| 2.4 **Consultation with relevant bodies**<br><br>Indicate if consultation was done on the skills programme intended for approval by the QCTO. Consultation may have taken place during the development of a skills programme. Such consultation may include but not limited to community of expert practitioners, regulatory bodies, professional bodies, statutory bodies/non-statutory bodies, relevant bodies etc.<br><br>NB: The intention of the consultation is to confirm relevance and applicability of skills programme content in the intended environment where it will be used. Proof of communication e.g. emails, letters etc. may be used as proof of consultation. Skills programme content endorsement by relevant industry stakeholders may be provided. | • University of Pretoria<br>• Bambili Energy<br>• Southern African Energy Confederation<br>• Water Research Commission<br>• National Cleaner Production Centre of South Africa<br>• Eskom<br>• Solidarity (Labour)<br>• Chieta<br>• EWSETA<br>• CSIR |
| 2.5 **Related registered qualification/s**<br><br>List registered qualification/s or part qualification/s where this skills programme will be recognised for Credit Accumulation and Transfer (CAT). | An occupational qualification in hydrogen fuel cell technology may be developed. This skills programme may be recognised for CAT in respect of the possible qualification. |
| 2.6 **Purpose**<br><br>a) Describe what the learner who acquires the skills programme will know and be able to do upon achieving a skills programme. | The purpose of the skills programme is to develop the first generation cohort of Hydrogen Fuel Cell System Technicians in South Africa. The |

| | | |
|---|---|---|
| b) List tasks that leaners who are competent in the skills programme will be able know do and understand after achievement of the skills programme. | participants will be able to:<br>• Prepare to install hydrogen fuel cell system<br>• Install hydrogen fuel cell system<br>• Operate the hydrogen fuel cell system<br>• Maintain the hydrogen fuel cell system | |
| **a) Skills Programme Components**<br><br>This skills programme is made up of the following components:<br>b) Knowledge/Theory Component<br>c) Application Component<br><br>Stipulate the compulsory modules and or elective modules where applicable.<br><br>In each of the two components modules to be covered are listed.<br><br>The modules are listed as follows:<br>d) Module code, Title, NQF Level, Credits<br>e) Total number of credits for each of the components must be indicated | **Knowledge/Theory Component**<br>Stipulate the compulsory modules and or elective modules where applicable.<br><br>• Module code, xxx, Health and Safety for Hydrogen Fuel Cell Systems (including Covid 19), basic fire prevention and chemical safety, electrical safety training, safe use of electrical and test instrument, SANS 10142, First Aid Training, NQF Level 4, Credits 4<br><br>• Module code, xxx, Global Energy, $CO_2$ Trends and Renewable Sources in South Africa, NQF Level 4, Credits 2<br><br>• Module code, xxx, Electricity (includes theory on wiring), NQF Level 4, Credits 2<br><br>• Module code, xxx, Hydrogen Fuel Cell System, NQF Level 5, Credits 4<br><br>• Module code, xxx, Site Inspection and Load Management/ Deployment Planning, NQF Level 5, Credits 2<br><br>• Module code, xxx, | **Application Component**<br>Stipulate the compulsory modules and or elective modules where applicable.<br><br>• Module Code, xxx, Conduct 240V single phase electrical wiring activities on panels, NQF Level 4, Credits 2<br><br>• Module code, xxx, Conduct site inspection, NQF Level 5, Credits 2<br><br>• Module code, xxx Plan deployment or load management, NQF Level 5, Credits 1<br><br>• Module code, xxx, Install and test functionality of hydrogen fuel cell system, NQF Level 5, Credits 3<br><br>• Module code, xxx, Conduct a range of tests (fuel test, methanol-water appearance test; methanol-water specific gravity test; methanol-water miscibility test, methanol-water boil down test) NQF Level 4, Credits 1<br><br>• Module code, xxx, Refuel hydrogen fuel cell, NQF Level 4, Credits 1<br><br>• Module code, xxx, Maintain hydrogen fuel cell system, NQF Level 5, Credits 2<br><br>• Module code, xxx, Error check and troubleshoot hydrogen fuel cell |

| | | |
|---|---|---|
| | Installation and Operation of the Hydrogen Fuel Cell System, NQF Level 5, Credits 2<br><br>• Module code, xxx, Testing, Maintenance, and System Monitoring NQF Level 5, Credits 3<br><br>Total number of credits for Knowledge Modules: 19 | system, NQF Level 5, Credits 2<br><br>• Module code, xxx, Monitor hydrogen fuel cell system, NQF Level 5 , Credits 1<br><br>Total number of credits for Application Modules: 15 |
| 2.7 **NQF Level**<br>Indicate the NQF Level of a skills programme.<br><br>Use the SAQA published level descriptors to help in determining the level of a skills programme. Keep to the range of competencies applicable for each of the levels in the level descriptors. | 5 | |
| 2.8 **Duration**<br>Indicate the number of days required to deliver the skills programme. (The minimum duration shall be two weeks) | 43 days (8.5 weeks) | |
| 2.9 **Credits**<br>Indicate the number of credits for the skills programme.<br><br>NB:<br>• The credit value is linked to the time required to achieve all competencies for the skills programme. The credits must be calculated on the basis of one credit is equal to ten notional hours.<br>• Notional Hours include:<br>a) Contact Time (physical and virtual);<br>b) Research;<br>c) Completion of Assignments;<br>d) Time spent in structured learning in the workplace or simulation;<br>e) Individual Learning; and | 34 | |

| | |
|---|---|
| f) Final Assessment. | |
| 2.10 **Minimum entry requirements**<br>Indicate what minimum learning is assumed to be in place for learners who want to enrol for this skills programme.<br>Refrain from indicating Age and other personal profiling as entry requirements.<br>Entry requirements should be justified by the content (e.g. Mathematics can not be minimum entry requirements if the content has no mathematics related Topics) | Learners must have either a N6 or National Diploma in either electrical or chemical engineering. Mechanical, civil and industrial engineers must have had some exposure to electrical aspects of the programme such as an introduction to electricity and electrical components. |
| 2.11 **Exit Level Outcomes and Associated Assessment Criteria**<br>**a) Exit Level Outcomes (ELOs)**<br>Indicate what a learner will be able to do and know as a result of completing the skills programme. The exit level outcomes must be frames against level descriptors.<br>These competencies should relate directly to the competencies required for further learning and or work.<br>**b) Associated Assessment Criteria (AACs)**<br>The Associated Assessment Criteria (AACs) must indicate what the learner must do to show competence, the knowledge involved, applications involved, the context, the standard of assessment and the range if applicable;<br>AACs must indicate the nature and level of the assessment associated with the skills programme and how the ELOs could be assessed;<br>AACs can be given as a comprehensive set to assess all the ELOs in an integrated manner or as a comprehensive set to assess ELOs separately | **Exit Level Outcome (ELO) 1**<br>Prepare to install hydrogen fuel cell system<br>**Associated Assessment Criteria**<br>• Historical and current energy systems are discussed in terms of energy demand, carbon emissions, climate change and energy resource depletion<br>• The types of renewable energy and the various renewable technologies developed thus far are described<br>• The importance of harnessing renewable energy sources is explained<br>• The types of hydrogen fuel cell systems are differentiated in terms of their components and their functions, and their process flows<br>• The integration of the hydrogen fuel cell sub-systems without losing valuable power/ efficiency is discussed<br>• The future hydrogen-based economy is discussed, and the operation of the hydrogen fuel cell system and generation of usable power are explained<br>• The method of conducting a site inspection is described and the purpose is explained<br>• All health and safety aspects relevant to the hydrogen fuel cell system are explained and demonstrated<br><br>**Exit Level Outcome (ELO) 2**<br>Install hydrogen fuel cell system<br>**Associated Assessment Criteria**<br>• The procedures for installing a hydrogen fuel cell system are explained<br>• A hydrogen fuel cell system is installed according to manufacturer's specifications and |

| | |
|---|---|
| | site inspection observations<br>• The operation of the installed system is tested and any problems and deviations are dealt with according to manufacturer's specifications<br>• The concepts of load management or deployment planning as they pertain to hydrogen fuel cell systems are explained<br>• All safety aspects pertaining to electrical and installation safety are adhered to<br>• All safety aspects pertaining to methanol and pressurised hydrogen gas bottles are observed |
| | **Exit Level Outcome (ELO) 4**<br>Conduct post hydrogen fuel cell system installation activities<br><br>**Associated Assessment Criteria**<br><br>• The purpose for fuel testing is explained and the method is described<br>• Fuel is tested according to manufacturer's instructions<br>• A range of tests are conducted according to manufacturer's instructions (fuel test, methanol-water appearance test; methanol-water specific gravity test; methanol-water miscibility test, methanol-water boil down test)<br>• The purpose of maintenance is explained and the aspects that constitute maintenance are described<br>• A hydrogen fuel cell system is maintained according to manufacturer's specifications<br>• The methods for checking and investigating errors, and for troubleshooting hydrogen fuel cell systems are described<br>• Errors on a hydrogen fuel cell system are checked and investigated according to manufacturer's instructions<br>• Troubleshooting is conducted on a hydrogen fuel cell system according to manufacturer's instructions<br>• The purpose of monitoring a hydrogen fuel cell system is explained and the method is described<br>• The basic parameters of a hydrogen fuel cell system are monitored and deviations are analysed and corrected according to manufacturer's instructions<br>• Safety aspects pertaining to refuelling, testing, maintenance, troubleshooting and monitoring are adhered to |
| **Assessments for Skills Programmes**<br>The level and nature of assessments must determine the learner's applied knowledge, attitudes and skills/competencies for successful completion of learning | **Continuous Assessment**<br>• Continuous assessment may be conducted in any format in order to ensure that all assessment criteria of each module has been met. Ensure that learners are provided with |

for the Skills Programme.

The following assessments must be conducted by the SDP:

- Continuous Assessment
- Supervised Assessment

Continuous Assessment:

The continuous assessments include formative and summative assessments, work integrated learning assessment, or any other forms of integrated learning assessment conducted to assist the learner in the learning process.

Final Supervised Assessment:

The final supervised assessment must be set, moderated and conducted by the SDP according to the information provided under "Final Supervised Assessment".

The SDP must ensure the following documentation/ processes are completed in order for the QCTO to approve these results for certification:

a) Upload learners on-line, using the QCTO portal for this purpose, within 3 days of starting the Skills Programme
b) Submit a completed "Notification Form" to the QCTO at least 10 days prior to the final supervised assessment (FSA). This form is available on the QCTO website (www.qcto.org.za)
c) Develop and moderate the FSA according to the standards set under "Supervised Assessment". SDP to ensure internal Moderator Report is completed by a Moderator, declaring the FSA "fit-for-purpose" *before the scheduled date of the FSA.* The moderator must be a Subject Matter Expert other than the facilitator that developed the FSA assessment instruments) and kept on record. These constructive feedback during these formative assessments in order to improve.
- After each module, a summative assessment must be completed by each learner and recorded by the SDP. Evidence of the summative assessment conducted must be kept for record purposes for a period of 5 years.
- Learners must be declared Competent in all practical summative assessments, and pass all knowledge modules with a minimum of 60%. Once learners have completed all modules successfully, they may sit for the Final Supervised Assessment.

**Final Supervised Assessment (FSA)**

- All learners gain entrance to the final Supervised Assessment by successfully completing ALL modules.
- All Exit Level Outcomes must be covered in the final Supervised Assessment, either in the Written or Practical Component (or both). Exit Level Outcomes may also be integrated.

- The final supervised assessment may not contain any assessments used in the "Continuous Assessment" process (thus no re-assessment); nor verbatim assessments from past FSAs conducted.
- The FSA must consist of two (2) components: a written and practical component

**Standards for the written component:**

- Typical work tasks must be created to suit the outcome(s) of the Exit Level Outcome(s) that have a knowledge outcome (that which the learner will be expected to know and apply in the workplace), by means of case studies, evaluation or analyses of possible problem situations, etc.
- This is the section where the learner must show applied knowledge.

**Standards for the practical component:**

- In this component, the learner should be provided with a brief to demonstrate skills; or a task to produce a product, etc. relevant to the Exit Level Outcome(s) that have a practical outcome.

| | |
|---|---|
| do not have to be constituent registered assessors and moderators, (unless it is a legal requirement) but must comply with the HR requirements as set out in the Skills Programme document.<br>d) The SDP must manage and conduct the FSA under examination conditions *(the accredited SDP must have a documented process or policy on the Administration and Conduct of the final Supervised Assessment)*<br>e) The SDP must mark/assess and moderate both components of the FSA, and the Moderator must complete the Moderator Report (template available on the QCTO website: www.qcto.org.za)<br>f) Results must be verified before being uploaded on-line to the QCTO portal – internal quality assurance processes by the SDP must be followed *(the accredited SDP must have a documented process or policy on the "Verification of Results")*<br>g) The QCTO has the right to request the SDP's documents mentioned in (d) and (f) at any time before approving results.<br>h) The QCTO will be sample monitoring the conduct of FSAs nationally, to ensure the above process and required standards and documentation is adhered to.<br>i) Finally, for submission and approval of results, all processes and required submissions as laid out in the "Notification" document must be complied with for the approval and certification of learner results.<br><br>For queries, please email Assessments@qcto.org.za | • This is the section where the learner must show applied skills<br>• Learners must pass the Written Component with a minimum of 60% AND be declared Competent in the Application Component in order to achieve an overall Pass/"C" as the final result.<br>• Should a learner fail both or one of the components, they may have 3 (three) further attempts in any component not achieved in order to achieve a successful final result. Failing to achieve this, it is recommended that the learner be re-registered for the Skills Programme tuition.<br><br>**% to be Moderated:**<br>• Number of learners that have completed the FSA to be moderated (QCTO Moderator Report to be completed):<br>10 or below: All<br>11 - 20: 50%<br>21 and above: 25%<br><br>**Certification requirements**:<br>A minimum of 60% must be obtained for the written component and the learner must be found "C" in the practical component of the final Supervised Assessment |
| 2.12 **Recognition of Prior Learning** | a. Learners will gain access to the skills programme through RPL for access as provided for in the QCTO RPL Policy. RPL for access is conducted by accredited education institution, skills development provider or workplace accredited to offer that specific skills programme. |

| | |
|---|---|
| | b. Learners who have acquired competencies in skills programme will be credited for such topics through RPL.<br>c. RPL for access to the Final Supervised Assessment: Accredited providers and approved workplaces must apply the internal assessment criteria specified in the skills programme document to establish and confirm prior learning and achievement of required competencies for the skills programme. |
| 2.13 **Work Opportunities/further learning**<br>Indicate work opportunities/ further learning available to a learner upon completing the skills programme. | Learners will be able to work as Hydrogen Fuel Cell System Technicians in a variety of environments like mining, industry etc.<br>Learners may have the opportunity of pursuing further studies in renewable energy at higher education institutions (HEIs). |
| 2.14 **Skills Development Provider Accreditation Requirements** | **Physical Requirements**<br>• Providers must have a training facility with all the resources to deliver the learning – theoretical and application - as set out in this document. Resources must include training manuals, other relevant documentation, hydrogen fuel cell systems and their related components and aspects, testing equipment, hydrogen for refuelling the system etc.<br>• Adequate area to accommodate the number of learners, as prescribed by the OHS Act. Also, the area must well-lit and well-ventilated<br>• Adequate area or space to carry out the application skills<br>**Human Resource Requirements**<br>• Facilitators/lecturers must have acquired a suitable degree or tertiary qualification in the electrical, electronic, automation or chemical engineering fields.<br>• Facilitators/lecturers must have experience with assessment and moderation in one of the engineering fields stated above.<br>• Facilitator/learner ratio 1:20 for theory<br>• Facilitator/learner ratio 1:5 for application<br>**Legal Requirements**<br>• Compliance with relevant legislation<br>• Accreditation with the appropriate quality assurance body. |