NATIONAL CERTIFICATES (VOCATIONAL)

ASSESSMENT GUIDELINES

ELECTRICAL SYSTEMS AND CONSTRUCTION

NQF LEVEL 2

IMPLEMENTATION: JANUARY 2013
ELECTRICAL SYSTEMS AND CONSTRUCTION – LEVEL 2

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SECTION A: PURPOSE OF THE SUBJECT ASSESSMENT GUIDELINES
This document provides the lecturer with guidelines to develop and implement a coherent, integrated assessment system for the subject Electrical Systems and Construction Level 2 in the National Certificates (Vocational). It must be read with the National Policy Regarding Further Education and Training Programmes: Approval of the Documents, Policy for the National Certificates (Vocational) Qualifications at Levels 2 to 4 on the National Qualifications Framework (NQF). This assessment guideline will be used for National Qualifications Framework Levels 2-4.

This document explains the requirements for the internal and external subject assessment. The lecturer must use this document with the Subject Guidelines to prepare for and deliver Electrical Systems and Construction Level 2. Lecturers should use a variety of resources and apply a range of assessment skills in the setting, marking and recording of assessment tasks.

SECTION B: ASSESSMENT IN THE NATIONAL CERTIFICATES (VOCATIONAL)

1. ASSESSMENT IN THE NATIONAL CERTIFICATES (VOCATIONAL)

Assessment in the National Certificates (Vocational) is underpinned by the objectives of the National Qualifications Framework (NQF). These objectives are to:

• Create an integrated national framework for learning achievements.
• Facilitate access to and progression within education, training and career paths.
• Enhance the quality of education and training.
• Redress unfair discrimination and past imbalances and thereby accelerate employment opportunities.
• Contribute to the holistic development of the student by addressing:
  ▪ social adjustment and responsibility;
  ▪ moral accountability and ethical work orientation;
  ▪ economic participation; and
  ▪ nation-building.

The principles that drive these objectives are:

• **Integration**
  To adopt a unified approach to education and training that will strengthen the human resources development capacity of the nation.

• **Relevance**
  To be dynamic and responsive to national development needs.

• **Credibility**
  To demonstrate national and international value and recognition of qualification and acquired
competencies and skills.

• **Coherence**
  To work within a consistent framework of principles and certification.

• **Flexibility**
  To allow for creativity and resourcefulness when achieving Learning Outcomes, to cater for different learning styles and use a range of assessment methods, instruments and techniques.

• **Participation**
  To enable stakeholders to participate in setting standards and co-ordinating the achievement of the qualification.

• **Access**
  To address barriers to learning at each level to facilitate students’ progress.

• **Progression**
  To ensure that the qualification framework permits individuals to move through the levels of the national qualification via different, appropriate combinations of the components of the delivery system.

• **Portability**
  To enable students to transfer credits of qualifications from one learning institution and/or employer to another institution or employer.

• **Articulation**
  To allow for vertical and horizontal mobility in the education system when accredited pre-requisites have been successfully completed.

• **Recognition of Prior Learning**
  To grant credits for a unit of learning following an assessment or if a student possesses the capabilities specified in the outcomes statement.

• **Validity of assessments**
  To ensure assessment covers a broad range of knowledge, skills, values and attitudes (SKVAs) needed to demonstrate applied competency. This is achieved through:
  • clearly stating the outcome to be assessed;
  • selecting the appropriate or suitable evidence;
  • matching the evidence with a compatible or appropriate method of assessment; and
  • selecting and constructing an instrument(s) of assessment.

• **Reliability**
  To assure assessment practices are consistent so that the same result or judgment is arrived at if the assessment is replicated in the same context. This demands consistency in the
interpretation of evidence; therefore, careful monitoring of assessment is vital.

• *Fairness and transparency*
To verify that no assessment process or method(s) hinders or unfairly advantages any student. The following could constitute unfairness in assessment:
• Inequality of opportunities, resources or teaching and learning approaches
• Bias based on ethnicity, race, gender, age, disability or social class
• Lack of clarity regarding Learning Outcome being assessed
• Comparison of students’ work with other students, based on learning styles and language

• *Practicability and cost-effectiveness*
To integrate assessment practices within an outcomes-based education and training system and strive for cost and time-effective assessment.

2 ASSESSMENT FRAMEWORK FOR VOCATIONAL QUALIFICATIONS
The assessment structure for the National Certificates (Vocational) qualification is as follows:

2.1 Internal continuous assessment (ICASS)
Knowledge, skills values, and attitudes (SKVAs) are assessed throughout the year using assessment instruments such as projects, tests, assignments, investigations, role-play and case studies. The internal continuous assessment (ICASS) practical component is undertaken in a real workplace, a workshop or a “Structured Environment”. This component is moderated internally and externally quality assured by Umalusi. All internal continuous assessment (ICASS) evidence is kept in a Portfolio of Evidence (PoE) and must be readily available for monitoring, moderation and verification purposes.

2.2 External summative assessment (ESASS)
The external summative assessment is either a single or a set of written papers set to the requirements of the Subject Learning Outcomes. The Department of Education administers the theoretical component according to relevant assessment policies.
A compulsory component of external summative assessment (ESASS) is the integrated summative assessment task (ISAT). This assessment task draws on the students’ cumulative learning throughout the year. The task requires integrated application of competence and is executed under strict assessment conditions. The task should take place in a simulated or “Structured Environment”. The integrated summative assessment task (ISAT) is the most significant test of students’ ability to apply their acquired knowledge.
The integrated assessment approach allows students to be assessed in more than one subject with the same integrated summative assessment task (ISAT).
External summative assessments will be conducted annually between October and December, with provision made for supplementary sittings.

3 MODERATION OF ASSESSMENT
3.1 Internal moderation
Assessment must be moderated according to the internal moderation policy of the Further Education and Training (FET) college. Internal college moderation is a continuous process. The moderator’s involvement starts with the planning of assessment methods and instruments and follows with continuous collaboration with and support to the assessors. Internal moderation creates common understanding of Assessment Standards and maintains these across vocational programmes.

3.2 External moderation
External moderation is conducted by the Department of Education, Umalusi and, where relevant, an Education and Training Quality Assurance (ETQA) body according to South African Qualifications Authority (SAQA) and Umalusi standards and requirements. The external moderator:
• monitors and evaluates the standard of all summative assessments;
• maintains standards by exercising appropriate influence and control over assessors;
• ensures proper procedures are followed;
• ensures summative integrated assessments are correctly administered;
• observes a minimum sample of ten (10) to twenty-five (25) percent of summative assessments;
• gives written feedback to the relevant quality assuror; and
• moderates in case of a dispute between an assessor and a student.
Policy on inclusive education requires that assessment procedures for students who experience barriers to learning be customised and supported to enable these students to achieve their maximum potential.

4 PERIOD OF VALIDITY OF INTERNAL CONTINUOUS ASSESSMENT (ICASS)

The period of validity of the internal continuous assessment mark is determined by the National Policy on the Conduct, Administration and Management of the Assessment of the National Certificates (Vocational).
The internal continuous assessment (ICASS) must be re-submitted with each examination enrolment for which it constitutes a component.

5 ASSESSOR REQUIREMENTS
Assessors must be subject specialists and a competent assessor.

6 TYPES OF ASSESSMENT

Assessment benefits the student and the lecturer. It informs students about their progress and helps lecturers make informed decisions at different stages of the learning process. Depending on the intended purpose, different types of assessment can be used.
6.1 Baseline assessment
At the beginning of a level or learning experience, baseline assessment establishes the knowledge, skills, values and attitudes (SKVAs) that students bring to the classroom. This knowledge assists lecturers to plan learning programmes and learning activities.

6.2 Diagnostic assessment
This assessment diagnoses the nature and causes of learning barriers experienced by specific students. It is followed by guidance, appropriate support and intervention strategies. This type of assessment is useful to make referrals for students requiring specialist help.

6.3 Formative assessment
This assessment monitors and supports teaching and learning. It determines student strengths and weaknesses and provides feedback on progress. It determines if a student is ready for summative assessment.

6.4 Summative assessment
This type of assessment gives an overall picture of student progress at a given time. It determines whether the student is sufficiently competent to progress to the next level.

7 PLANNING ASSESSMENT
An assessment plan should cover three main processes:

7.1 Collecting evidence
The assessment plan indicates which Subject Outcomes and Assessment Standards will be assessed, what assessment method or activity will be used and when this assessment will be conducted.

7.2 Recording
Recording refers to the assessment instruments or tools with which the assessment will be captured or recorded. Therefore, appropriate assessment instruments must be developed or adapted.

7.3 Reporting
All the evidence is put together in a report to deliver a decision for the subject.

8 METHODS OF ASSESSMENT
Methods of assessment refer to who carries out the assessment and includes lecturer assessment, self-assessment, peer assessment and group assessment.
### LECTURER ASSESSMENT
The lecturer assesses students’ performance against given criteria in different contexts, such as individual work, group work, etc.

### SELF-ASSESSMENT
Students assess their own performance against given criteria in different contexts, such as individual work, group work, etc.

### PEER ASSESSMENT
Students assess another student or group of students’ performance against given criteria in different contexts, such as individual work, group work, etc.

### GROUP ASSESSMENT
Students assess the individual performance of other students within a group or the overall performance of a group of students against given criteria.

### 9 INSTRUMENTS AND TOOLS FOR COLLECTING EVIDENCE

All evidence collected for assessment purposes is kept or recorded in the student’s Portfolio of Evidence (PoE).

The following table summarises a variety of methods and instruments for collecting evidence. A method and instrument is chosen to give students ample opportunity to demonstrate the Subject Outcome has been attained. This will only be possible if the chosen methods and instruments are appropriate for the target group and the Specific Outcome being assessed.

<table>
<thead>
<tr>
<th>METHODS FOR COLLECTING EVIDENCE</th>
<th>Observation-based (Less structured)</th>
<th>Task-based (Structured)</th>
<th>Test-based (More structured)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment instruments</td>
<td>• Observation</td>
<td>• Assignments or tasks</td>
<td>• Examinations</td>
</tr>
<tr>
<td></td>
<td>• Class questions</td>
<td>• Projects</td>
<td>• Class tests</td>
</tr>
<tr>
<td></td>
<td>• Lecturer, student, parent</td>
<td>• Investigations or</td>
<td>• Practical examinations</td>
</tr>
<tr>
<td></td>
<td>discussions</td>
<td>research</td>
<td>• Oral tests</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Case studies</td>
<td>• Open-book tests</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Practical exercises</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Demonstrations</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Role-play</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Interviews</td>
<td></td>
</tr>
<tr>
<td>Assessment tools</td>
<td>• Observation</td>
<td>• Checklists</td>
<td>• Marks (e.g. %)</td>
</tr>
</tbody>
</table>
| Evidence | sheets  | • Lecturer’s notes  
|          | • Comments | • Rating scales  
|          |          | • Rubrics  
|          |          | • Rating scales (1-7)  
|          |          |  
| Evidence | • Focus on individual students  
|          | • Subjective evidence based on lecturer observations and impressions | **Open middle:** Students produce the same evidence but in different ways.  
|          |          | **Open end:** Students use same process to achieve different results.  
|          |          | Students answer the same questions in the same way, within the same time.  

### 10 TOOLS FOR ASSESSING STUDENT PERFORMANCE

**Rating scales** are marking systems where a symbol (such as 1 to 7) or a mark (such as 5/10 or 50%) is defined in detail. The detail is as important as the coded score. Traditional marking, assessment and evaluation mostly used rating scales without details such as what was right or wrong, weak or strong, etc.

**Task lists** and **checklists** show the student what needs to be done. They consist of short statements describing the expected performance in a particular task. The statements on the checklist can be ticked off when the student has adequately achieved the criterion. Checklists and task lists are useful in peer or group assessment activities.

**Rubrics** are a hierarchy (graded levels) of criteria with benchmarks that describe the minimum level of acceptable performance or achievement for each criterion. It is a different way of assessment and cannot be compared to tests. Each criterion described in the rubric must be assessed separately. Mainly, two types of rubrics, namely holistic and analytical, are used.

### 11 SELECTING AND/OR DESIGNING RECORDING AND REPORTING SYSTEMS

The selection or design of recording and reporting systems depends on the purpose of recording and reporting student achievement. **Why** particular information is recorded and **how** it is recorded determine which instrument will be used. Computer-based systems, for example spreadsheets, are cost and time effective. The recording system should be user-friendly and information should be easily accessed and retrieved.

### 12 COMPETENCE DESCRIPTIONS
All assessment should award marks to evaluate specific assessment tasks. However, marks should be awarded against rubrics and not simply be a total of ticks for right answers. Rubrics should explain the competence level descriptors for the skills, knowledge, values and attitudes (SKVAs) a student must demonstrate to achieve each level of the rating scale. When lecturers or assessors prepare an assessment task or question, they must ensure that the task or question addresses an aspect of a Subject Outcome. The relevant Assessment Standard must be used to create the rubric to assess the task or question. The descriptions must clearly indicate the minimum level of attainment for each category on the rating scale.

13 STRATEGIES FOR COLLECTING EVIDENCE

A number of different assessment instruments may be used to collect and record evidence. Examples of instruments that can be (adapted and) used in the classroom include:

13.1 Record sheets
The lecturer observes students working in a group. These observations are recorded in a summary table at the end of each project. The lecturer can design a record sheet to observe students’ interactive and problem-solving skills, attitudes towards group work and involvement in a group activity.

13.2 Checklists
Checklists should have clear categories to ensure that the objectives are effectively met. The categories should describe how the activities are evaluated and against what criteria they are evaluated. Space for comments is essential.
ASSESSMENT IN ELECTRICAL SYSTEMS AND CONSTRUCTION

NQF LEVEL 2
SECTION C: ASSESSMENT IN ELECTRICAL SYSTEMS AND CONSTRUCTION LEVEL 2

1 ASSESSMENT SCHEDULE AND REQUIREMENTS

Internal and external assessments are conducted and the results of both are contributing to the final mark of a student in the subject.

The internal continuous assessment (ICASS) mark accounts for 50 percent and the external examination mark for 50 percent of the final mark. A student needs a minimum final mark of 50 percent to enable a pass in the subject.

1.1 Internal assessment

Lecturers must compile a detailed assessment plan and assessment schedule of internal assessments to be undertaken during the year in the subject. (e.g. date, assessment task/or activity, rating code/marks allocated, assessor, moderator.)

All internal assessments are then conducted according to the plan and schedule using appropriate assessment instruments and tools for each assessment task (e.g. tests, assignments, practical tasks/projects and memorandum, rubric, checklist)

The marks allocated to both the minimum number of practical and written assessment tasks conducted during the internal continuous assessment (ICASS) are kept and recorded in the Portfolio of Evidence (PoE) which is subjected to internal and external moderation.

A year mark out of 100 is calculated from the ICASS marks contained in the PoE and submitted to the Department on the due date towards the end of the year.

The following internal assessment units GUIDE the internal assessment of Electrical Systems and Construction Level 2

<table>
<thead>
<tr>
<th>TASKS</th>
<th>Time-frame</th>
<th>Type of assessment activity</th>
<th>Time and proposed mark allocation *(can be increased but not reduced)</th>
<th>Scope of assessment</th>
<th>% contribution to the year mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Term 1</td>
<td>Test</td>
<td>1 Hour (50 marks)</td>
<td>Topics completed in term 1</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>Term 1</td>
<td>Practical Assessment/ Assignment</td>
<td>Determined by the scope and nature of the task</td>
<td>One or more of the topics completed as an assignment</td>
<td>25</td>
</tr>
</tbody>
</table>
Specifications for internal assessment may change over time. A separate internal assessment guideline document ‘Guidelines for the Implementation of Internal Continuous Assessment (ICASS) in the NC(V) qualifications at FET Colleges’ is developed, updated and distributed by the Department. The conduct and administration of internal assessments must always comply with specifications contained in the most current version of the guideline document.

2 RECORDING AND REPORTING

Electrical Systems and Construction is assessed according to five levels of competence. The level descriptions are explained in the following table.

**Scale of Achievement for the Vocational component**

<table>
<thead>
<tr>
<th>RATING CODE</th>
<th>RATING</th>
<th>MARKS %</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Outstanding</td>
<td>80-100</td>
</tr>
<tr>
<td>4</td>
<td>Highly Competent</td>
<td>70-79</td>
</tr>
<tr>
<td>3</td>
<td>Competent</td>
<td>50-69</td>
</tr>
<tr>
<td>2</td>
<td>Not yet competent</td>
<td>40-49</td>
</tr>
<tr>
<td>1</td>
<td>Not achieved</td>
<td>0-39</td>
</tr>
</tbody>
</table>

The planned/scheduled assessment should be recorded in the Lecturer’s Portfolio of Assessment (PoA) for each subject. The minimum requirements for the Lecturer’s Portfolio of Assessment should be as follows:

- Lecturer information
- A contents page
- Subject and Assessment Guidelines
- A subject Year plan /Work scheme/Pace Setter
- A subject assessment plan
- Instrument(s) (tests, assignments, practical) and tools (memorandum, rubric, checklist) for each assessment task
A completed pre-moderation checklist for each of the ICASS tasks and their accompanying assessment tools
A completed post-moderation checklist once the task has been administered and assessed
Subject record sheets per level/class reflecting the marks achieved by students in the ICASS tasks completed
Evidence of review – diagnostic and statistical analysis, including notes on improvement of the task for future use

The college could standardise these documents.

The minimum requirements for the student’s Portfolio of Evidence (PoE) should be as follows:

- Student information/identification
- Declaration of authenticity form – duly completed (signed and dated)
- A contents page/list of content (for accessibility)
- A subject assessment schedule
- The evidence of marked assessment tasks and feedback according to the assessment schedule
- A record/summary/ of results showing all the marks achieved per assessment for the subject
- Evidence of moderation (only where applicable for student’s whose tasks were moderated)
- Where tasks cannot be contained as evidence in the Portfolio of Evidence (PoE), its exact location must be recorded and it must be readily available for moderation purposes.
### 3 INTERNAL ASSESSMENT OF SUBJECT OUTCOMES IN ELECTRICAL SYSTEMS AND CONSTRUCTION – LEVEL 2

#### Topic 1: Basic Electrical Circuits and Systems

<table>
<thead>
<tr>
<th>SUBJECT OUTCOME</th>
<th>LEARNING OUTCOMES</th>
</tr>
</thead>
</table>
| **1.1: Install, test and replace basic electrical circuits and systems** | - Read and interpret electric circuit diagrams and related symbols correctly.  
- Plan and prepare for an electrical installation job in accordance with job requirements and workplace standards and policies and procedures.  
- Perform an electrical installation according to relevant SABS standards on domestic installations.  
- Test the installation according to relevant SABS standards on domestic installations. (Faults are simulated and the student does fault-finding and reports on the outcome.)  
- Ensure that electrical installations function properly and meet the job requirements.  
- Replace and maintain electrical equipment in a domestic dwelling.  
- Clean the worksite. |

#### ASSESSMENT STANDARDS

- Basic electrical circuits and systems are effectively installed, tested and replaced.  
- The installation is tested according to relevant SABS standards on domestic installations.

#### ASSESSMENT TASKS OR ACTIVITIES

Assessment tasks or activities include but are not limited to:  
- Students install, test and replace, commission and maintain basic electrical circuits and systems. An oral or written test precedes the practical assessment.  
- Students are tested on interpretation of regulations, task requirements, understanding of drawings and the execution of the task.  
- Students draw and interpret plans and produce a list of required components, tools and instruments to successfully execute the task. The task can be done in a “Simulated Environment”. Students must be informed on all points of assessment, for example, neatness counts 5%.  
- A distribution board (single phase typically found in average household),  
- Entry to a dwelling (cables and conductors),  
- House wiring (single phase only),  
- Earthing and bonding on electrical installations,  
- Low voltage transformers and luminaire units.
# Topic 2: Low Voltage Cables and Wire Ways

## SUBJECT OUTCOME

### 2.1: Join low voltage cables.

**Range:**
- Cables include armoured cables;
- Terminations include lugs and terminal blocks;
- Joining includes: screw-its, connecting block, Line taps, tee-joints, Britannia joints, married joints, and barrel and twist joint and jointing kits.

## ASSESSMENT STANDARD

<table>
<thead>
<tr>
<th>ASSESSMENT TASKS OR ACTIVITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment tasks or activities include but are not limited to:</td>
</tr>
<tr>
<td>- Students’ understanding of low voltage electric cords, conductors and electric cables, methods commonly used for joining them, the equipment required and safety aspects are tested verbally and in writing.</td>
</tr>
<tr>
<td>- Students join low voltage cables. Joining can be done on sample cords, conductors and electric cables in a training facility. Work done must comply with SANS 10142 and SANS 10198.</td>
</tr>
</tbody>
</table>

## LEARNING OUTCOMES

- List basic safety rules when joining cables.
- Create a safe working environment before joining cables.
- Explain the regulations relating to joining of cables according to relevant SABS standards.
- Describe the characteristic of a good joint.
- List the factors to consider joining cables.
- Explain types of joints and methods commonly used to join low voltage electric cords, conductors and electric cables.
- Illustrate and demonstrate how armoured cables are joined.
- Demonstrate how a cable gland is fitted to an armoured cable.
- Select the most suitable joining procedure for the application.
- Join the cable, inspect and test the joint.
- Join and solder multi-strand insulated conductors.
- Use terminal blocks and screw-its for joining.
- Use a joining kit to join an un-armoured cable.
- Clean the work area and store equipment correctly.

## ASSESSMENT TASKS OR ACTIVITIES

- Students’ understanding of low voltage electric cords, conductors and electric cables, methods commonly used for joining them, the equipment required and safety aspects are tested verbally and in writing.
- Students join low voltage cables. Joining can be done on sample cords, conductors and electric cables in a training facility. Work done must comply with SANS 10142 and SANS 10198.
### SUBJECT OUTCOME

#### 2.2: Explain and install wire ways.  
*Range: Conduits (PVC and steel) and accessories, conduit bending, cutting and threading, termination of conduit, flexible conduits, trunking and cable trays.*  

<table>
<thead>
<tr>
<th>ASSESSMENT STANDARD</th>
<th>LEARNING OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Wire ways are identified and the purpose, design and installation of wire ways is explained.</td>
<td>• Explain the purpose of wire ways.</td>
</tr>
<tr>
<td>• The installation of wire ways is completed by team members.</td>
<td>• Identify wire ways and install cabling.</td>
</tr>
<tr>
<td></td>
<td>• Work as a member of a team and assist in the installation of wire ways.</td>
</tr>
</tbody>
</table>

#### ASSESSMENT TASKS OR ACTIVITIES

Assessment tasks or activities include but are not limited to:

- Students’ understanding of the purpose and design of wire ways is tested verbally and in writing. Students also interpret SANS 10142 regulation 6.5 on wire ways.

### Topic 3: Electric Machines

#### SUBJECT OUTCOME

#### 3.1: Inspect and clean an electric machine  
*Range: DC and AC machines not exceeding 10kW and reversing the direction of rotation of DC motors (series, shunt and compound)- AC induction motors limited to capacitor start- capacitor run- motors, permanent capacitor motors, capacitor- start induction- run motors, resistance- start induction-run motor, induction-start induction- run motors, universal and shaded-pole motors, excludes machine installation.*  

<table>
<thead>
<tr>
<th>ASSESSMENT STANDARD</th>
<th>LEARNING OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The connection of diagrams, electrical components, instruments to use, wiring code specifications, regulations, safety requirements, testing procedures, and documentation required when inspecting and cleaning electric machines are explained.</td>
<td>• Explain statutory requirements when working on electrical machinery.</td>
</tr>
<tr>
<td>• A small electric machine is correctly identified, inspected and cleaned.</td>
<td>• Reproduce typical connection diagrams, showing the connections to the supply or load.</td>
</tr>
<tr>
<td></td>
<td>• Identify types of machines by supply or load connections, types of application, terminal layout, ID plate and visual appearance.</td>
</tr>
<tr>
<td></td>
<td>• Describe electrical and mechanical inspection procedures when working on electrical machinery.</td>
</tr>
<tr>
<td></td>
<td>• Explain the purpose of a motor control.</td>
</tr>
<tr>
<td></td>
<td><em>Range: Starting, stopping, reversing, running, speed control, safety of operator, protection from damage.</em></td>
</tr>
<tr>
<td></td>
<td>• List the types of motor enclosures.</td>
</tr>
<tr>
<td></td>
<td><em>Range: Screen protected drip-proof, flame-proof and pipe ventilated.</em></td>
</tr>
<tr>
<td></td>
<td>• List the types of motors bases.</td>
</tr>
<tr>
<td></td>
<td><em>Range: slide rails, foundation studs and metallic bases.</em></td>
</tr>
</tbody>
</table>
• List the types of motors coupling. 
  *Range: flexible, direct, Gear, belt and pulley coupling.*
• Explain permit to work system and lock out procedures.
• Clean electrical machinery in accordance with workplace standards.

**ASSESSMENT TASKS OR ACTIVITIES**

Assessment tasks or activities include but are not limited to:

- Students’ understanding of connection diagrams, electrical components, instrument use, wiring code specifications, regulations, safety requirements, testing procedures and administrative work is tested verbally and in writing.
- Students identify, inspect and clean an electric machine.

**Topic 4: Fault-Finding and Testing**

**SUBJECT OUTCOME**

4.1: Test and find the faults in electrical components.
*Range: Includes but is not limited to (a) continuity tests, (b) deviations from manufacturer’s specifications (c) whether component is operational or functioning*

**ASSESSMENT STANDARD**

- Basic electrical components are effectively tested for faults.
  *Range: fuses, circuit breakers, switches, thermostats, luminaires, transformers, earth leakage relays and isolators.*

**LEARNING OUTCOMES**

- List the possible tests that can be carried out on the components.
- Explain how to test and find faults in electrical components
- Test electrical components

**ASSESSMENT TASKS OR ACTIVITIES**

Assessment tasks or activities include but are not limited to:

- Students’ understanding of connection diagrams, electrical components, instrument use, wiring code specifications, regulations, safety requirements, testing procedures, administrative work is tested verbally and in writing.
- Students test and find faults in electrical components.
### Topic 5: Protection and Measuring Instruments

<table>
<thead>
<tr>
<th>SUBJECT OUTCOME</th>
<th>LEARNING OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>5.1: Install and replace electrical metering units and measuring instruments.</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Range:</strong></td>
<td></td>
</tr>
<tr>
<td>a. Installing and replacing under dead conditions only.</td>
<td></td>
</tr>
<tr>
<td>b. Preparation includes but is not limited to marking off, cutting, drilling and filing.</td>
<td></td>
</tr>
<tr>
<td>c. Mounting includes but is not limited to direct on surface, din rail and embedded.</td>
<td></td>
</tr>
<tr>
<td>d. Symbols and abbreviations include but are not limited to A = ammeter, V = voltmeter, kWh = kilowatt hour meter, Hz = frequency meter, PF = power factor meter, ECU = energy control unit (ripple relay, load control relay and timers) and ED (electricity dispenser).</td>
<td></td>
</tr>
<tr>
<td>e. Measuring instrument displays include but are not limited to analogue, digital and numeric types.</td>
<td></td>
</tr>
<tr>
<td>f. Metering unit types include but are not limited to analogue, digital, numeric and magnetic types and prepaid meters.</td>
<td></td>
</tr>
<tr>
<td><strong>ASSESSMENT STANDARD</strong></td>
<td></td>
</tr>
<tr>
<td>• The installation and replacement of basic electrical metering units and measuring instruments are effectively planned and executed according to instructions using the appropriate hand and power tools and adhering to correct safety precautions.</td>
<td></td>
</tr>
<tr>
<td>• Plan to install and replace electrical metering units and measuring instruments.</td>
<td></td>
</tr>
<tr>
<td>• Interpret task requirements according to instructions and diagrams.</td>
<td></td>
</tr>
<tr>
<td>• Select and obtain, as per specifications, metering units and measuring instruments.</td>
<td></td>
</tr>
<tr>
<td>• Select tools and equipment according to job requirements.</td>
<td></td>
</tr>
<tr>
<td>• Correctly identify the location for mounting.</td>
<td></td>
</tr>
<tr>
<td>• Obtain authorisation for access to restricted areas and possible downtime.</td>
<td></td>
</tr>
<tr>
<td>• Obtain the required safety equipment and material.</td>
<td></td>
</tr>
<tr>
<td>• Communicate working schedule to affected parties.</td>
<td></td>
</tr>
<tr>
<td>• Correctly prepare area for the mounting procedure.</td>
<td></td>
</tr>
<tr>
<td>• Mark off metering unit and measuring instrument dimensions as per specifications.</td>
<td></td>
</tr>
<tr>
<td>• Correctly select and use hand and power tools to meet the job requirements.</td>
<td></td>
</tr>
<tr>
<td>• Mount and secure metering unit and measuring instrument.</td>
<td></td>
</tr>
<tr>
<td>• Connect metering unit and measuring instrument as per instruction and specification.</td>
<td></td>
</tr>
<tr>
<td>• Adhere to safety precautions before, during and after the mounting procedure.</td>
<td></td>
</tr>
</tbody>
</table>
ASSESSMENT TASKS OR ACTIVITIES

Assessment tasks or activities include but are not limited to:

- Students’ understanding of connection diagrams, electrical components, instrument use, wiring code specifications, regulations, safety requirements, testing procedures and administrative work is tested verbally and in writing.
- Students install and replace electrical metering units or measuring instruments.
- Students draw and interpret plans and produce a list of required components, tools and instruments to successfully execute the task.
- The task can be done in a “Simulated Environment”. Students must be informed on the points of assessment, for example, neatness counts 5%.

SUBJECT OUTCOME

5.2: Complete the installation and replacement of a metering unit and a measuring instrument on a panel.

<table>
<thead>
<tr>
<th>ASSESSMENT STANDARD</th>
<th>LEARNING OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>● The re-energising of the circuit is checked and the correct operation of the replaced metering unit and measuring instrument is verified</td>
<td>● Ensure the re-energising of the circuit and verify the correct operation of the replaced metering unit or measuring instrument.</td>
</tr>
<tr>
<td>● Documentation is completed and the tools and equipment are checked, cleaned and stored to ensure the workplace is left in its original state.</td>
<td>● Discard all waste and scrap materials and equipment as per environmental and safety policies and standards.</td>
</tr>
<tr>
<td></td>
<td>● Correctly check, clean and store all tools and equipment as per worksite standards and procedures.</td>
</tr>
<tr>
<td></td>
<td>● Restore workplace to original state as per housekeeping standards and worksite procedures and standards.</td>
</tr>
<tr>
<td></td>
<td>● Sign off and submit all relevant documentation such as the job card.</td>
</tr>
</tbody>
</table>

ASSESSMENT TASKS OR ACTIVITIES

Assessment tasks or activities include but are not limited to:

- Students complete practical tasks on the installation and replacement of metering and measuring units
Topic 6: Renewable Energy

SUBJECT OUTCOME
6.1: Understand how photovoltaic and solar thermal systems function and operate.

ASSESSMENT STANDARD
- The operation of a photovoltaic cell is described.
- The composition of a photovoltaic panel is explained.
- Photovoltaic arrays are described in terms of connection configurations.
- The function of photovoltaic arrays is explained in terms of their application.

LEARNING OUTCOMES
- Describe the operation of a photovoltaic cell.
- Explain the composition of a photovoltaic panel.
- Describe photovoltaic arrays in terms of connection configurations.
- Explain the function of photovoltaic arrays in terms of their application.

ASSESSMENT TASKS OR ACTIVITIES
Assessment tasks or activities include but are not limited to:
- Written tests on the function and operation of photovoltaic and solar thermal systems.

SUBJECT OUTCOME
6.2: Sketch a basic renewable energy circuit diagram

ASSESSMENT STANDARD
- Renewable energy circuit instructions are interpreted.
- Symbols used in renewable energy circuit diagrams conform to ISO standards.
- The function of each component is described.
- Renewable energy circuit diagrams are neatly sketched according to instructions.
- Actions are taken to ensure the circuit diagrams are functional.

LEARNING OUTCOMES
- Interpret renewable energy circuit instructions according to work site procedures.
- Ensure that symbols used in a renewable energy circuit diagram conform to ISO standards.
- Describe the function of each component in a renewable energy circuit.
- Sketch renewable energy circuit diagrams neatly according to instructions.
- Ensure that circuit diagrams are functional according to instructions.

ASSESSMENT TASKS OR ACTIVITIES
Assessment tasks or activities include but are not limited to:
- Written tests on sketching and interpretation of renewable energy circuit diagrams

4 SPECIFICATIONS FOR EXTERNAL ASSESSMENT IN SUBJECT ELECTRICAL SYSTEMS AND CONSTRUCTION– LEVEL 2
4.1 Integrated summative assessment task (ISAT)
A compulsory component of the external assessment (ESASS) is the integrated summative assessment task (ISAT). The ISAT draws on the students’ cumulative learning achieved throughout the year. The task requires integrated application of
competence and is executed and recorded in compliance with assessment conditions. Two approaches to the integrated summative assessment task (ISAT) may be as follows:

The students are assigned a task at the beginning of the year which they will have to complete in phases throughout the year to obtain an assessment mark. A final assessment is made at the end of the year when the task is completed.

OR

Students achieve the competencies throughout the year but the competencies are assessed cumulatively in a single assessment or examination session at the end of the year.

The integrated summative assessment task (ISAT) is set by an externally appointed examiner and is conveyed to colleges in the first quarter of the year. The integrated assessment approach enables students to be assessed in more than one subject with the same ISAT.

4.2 National Examination

A National Examination is conducted annually in October/November by means of a paper(s) set and moderated externally. The following distribution of cognitive application should be followed:

<table>
<thead>
<tr>
<th>LEVEL 2</th>
<th>KNOWLEDGE</th>
<th>COMPREHENSION AND APPLICATION</th>
<th>ANALYSIS, SYNTHESIS AND EVALUATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50-60% %</td>
<td>30-40%</td>
<td>0-10%</td>
</tr>
</tbody>
</table>