



education

Department:
Education
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

SUBJECT GUIDELINES

ELECTRICAL WORKMANSHIP

NQF Level 4

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ELECTRICAL WORKMANSHIP – LEVEL 4

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INTRODUCTION

A. What is Electrical Workmanship?

Electrical Workmanship introduces students to technical fields. It will equip students with the necessary hand-skills for the construction industry. Workshop and fieldwork procedures that conform to safety regulations and safe working practices will also be learnt.

Electrical Workmanship introduces this field of learning to students. Students will have been introduced to the subject "Workshop Practice" at Level 2 and Electrical Workmanship continues to practically implement the learning material. Although some of the work is repeated, this gives students a solid foundation of knowledge.

B. Why is Electrical Workmanship important in the Electrical Infrastructure Construction programme?

Workshop Practice will equip students with the necessary hand-skills, safety consciousness and first aid knowledge and accustom students to technical environments.

Electrical Workmanship contains enough trade specific skills, knowledge, attitudes and values so that students can maintain, repair and construct basic electrical systems in practice.

C. The link between the Learning Outcomes for Electrical Workmanship and the Critical and Developmental Outcomes

Students will be taught to:

- Identify and solve problems:
 - Recognise principles of electricity and react appropriately.
- Work effectively with others:
 - Solve electricity-related problems.
- Organise and manage their activities and themselves:
 - Apply planned procedures for using, storing and looking after equipment, tools, test equipment, drawings and parts.
- Collect, organise and evaluate information and take appropriate action:
 - Use media centres to collect information.
- Communicate effectively:
 - Use common names for electrical equipment, tools, test equipment, drawings and parts.
- Use science and technology:
 - Use and apply science and technology principles in both theory and practice.
- Demonstrate understanding of subject content through the application of acquired knowledge:
 - Solve problems by using subject contents.

D. Factors that contribute to achieving the Electrical Workmanship Learning Outcomes

- An understanding of technical (electro-mechanical) principles
- An analytical ability
- An ability to do mathematical calculations and manipulations
- Hand skills (practical skills)
- Practical improvisation abilities

1 DURATION AND TUITION TIME

This is a one year instructional programme comprising 200 teaching and learning hours. The subject may be offered on a part-time basis provided all of the assessment requirements set out hereunder are adhered to.

2 SUBJECT LEVEL FOCUS

- Apply principles of electricity to maintain electrical appliances and installations
- Use electrical equipment in electrical construction
- Understand and use fault finding procedures
- Test and maintain electrical systems
- Gain practical

3 ASSESSMENT REQUIREMENTS

3.1 Internal assessment (constitutes 50 percent of the final mark)

An assessor with at least a certificate of competence must finalise all internal assessments.

3.1.1 Theoretical Component

The theoretical component will form 40 percent of the internal assessment.

3.1.2 Practical Component

The practical component will form 60 percent of the internal assessment.

All practical components must be indicated in a Portfolio of Evidence (PoE).

Please note that a mathematical calculation that makes use of the theoretical background of the student can be considered to be the practical component.

3.1.3 Processing of internal assessment mark for the year

A year mark out of 100 is calculated by adding the marks of the theoretical component and the practical component of the internal continuous assessment.

3.1.4 Moderation of internal assessment mark

Internal Assessment is subject to internal and external moderation procedures as set out in the *National Examinations Policy for Further Education and Training College Programmes*.

3.2 External assessment (constitutes 50 percent of the final mark)

A national examination is conducted annually in October or November by means of a paper/s set externally and marked and moderated internally.

External assessment details are set out in the *Assessment Guidelines: Electrical Workmanship (Level 4)*.

4 WEIGHTED VALUES OF TOPICS

TOPICS	WEIGHTED VALUE
1. Typical electrical installations	20%
2. Domestic appliances	20%
3. Low voltage transformers and switchgear	20%
4. Electric machines and control gear	20%
5. Electrical Entrepreneurship/Safety and first aid	20%
TOTAL	100

5 CALCULATION OF FINAL MARK

Continuous assessment:	Student's mark/100 x 50/1 = a mark out of 50	(a)
examination mark:	Student's mark/100 x 50/1 = a mark out of 50	(b)
Final mark:	(a) + (b) = a mark out of 100	

All marks are systematically processed and accurately recorded to be available as hard copy evidence for, amongst others, purposes of moderation and verification.

6 PASS REQUIREMENTS

The student must obtain at least fifty (50) percent in ICASS and fifty percent (50) in the examination.

7 SUBJECT OUTCOMES AND LEARNING OUTCOMES

On completion of Electrical Workmanship Level 4 the student should have covered the following topics:

Topic 1:	Typical electrical installations
Topic 2:	Domestic appliances
Topic 3:	Low voltage transformers and switchgear
Topic 4:	Electric machines and control gear
Topic 5:	Electrical Entrepreneurship/Safety and first aid

7.1 Topic 1: Typical electrical installations

7.1.1 Subject Outcome 1: Understand typical electrical installations.

Range: Electric circuits include lighting, plugs, distribution, electric machines and control circuits. SABS 0142 regulations will be given in tests and exams and the questions asked will be to test the understanding of the regulation only.

Learning Outcomes:

- Read and interpret electric circuit diagrams.
- Use and describe International Electrotechnical Commission (IEC) and *Systeme Internationale* (SI) symbols, units and abbreviations for electrical and mechanical quantities correctly.
- Understand and use DC theory and network analysis in solving RLC circuits.
- Understand the application of electromagnetic theory in electric machines and transformers.
- Have a basic knowledge of, and be able to interpret and apply the SABS 0142 regulations (e.g. flame-proof environments, permissible volt-drops in supply cabling, conductor and insulator factor values and fault current calculations).

7.2 Topic 2: Domestic appliances

7.2.1 Subject Outcome 1: Understand the operation of domestic appliances.

Range: Includes but is not limited to laundry irons, space heaters (radiation, convection and fan heaters), electric kettles, washing machines (centre agitator, side spinner and rotating drum type; automatic and twin-tub type), cooking appliances (hot-plates, ovens and micro-wave ovens), water heaters (cistern and pressure type) and tumble dryers.

Learning Outcomes:

- Identify the appliance and explain the operating principles of the appliance.
- Distinguish between the various types of appliances that may be used for the same application.
- State the maintenance procedures relevant to each domestic appliance.
- State regulations regarding domestic appliances.
- Draw circuit diagrams to wire a stove plate for low, medium and high heat.
- Explain the procedures to replace components in domestic appliances (simmerstat and oven switches, heater elements and thermostats; wash, spin and tumble-dry motors).

7.3 Topic 3: Low voltage transformers and switchgear

7.3.1 Subject Outcome 1: Clean, inspect, test and maintain low voltage transformers and switchgear

Range: Includes but is not limited to; All work to be carried out under direct supervision. Applying worksite procedures. Apply isolating procedures (obtain permits, use lockout systems and complete the workman's register). Conforming to statutory requirements. Single and 3-ph transformers and switchgear. Voltages less than 1000V.

Learning Outcomes:

- Draw up a written plan and organize a schedule for the effective and efficient completion of the task (ordering of equipment, permission to work on equipment, isolation of circuitry, notices and lock-out switches, order in the work area, etc.).
- Explain reasons for each step in the schedule.
- Show a logical sequence of events.
- Identify and abide by worksite procedures, safety signs, work-areas, no-go areas and maintenance programs.
- Properly clean work areas after completion of task.
- Carry out transformer insulating oil sampling and voltage breakdown tests.
- Carry out transformer induced voltage tests.
- Carry out switchgear movable mechanism speed, insulation and induction tests.
- Carry out switchgear maintenance on the contacts, moveable parts, bushes, rollers and springs.

7.4 Topic 4: Electric machines and control gear

7.4.1 Subject Outcome 1: Install, connect, commission, clean, inspect, test and maintain electric machines and control gear.

Range: Includes but is not limited to; Induction, slip-ring, synchronous and universal motors and alternators. Direct-on-line, star-delta, sequenced, forward and reverse, resistance, slip-ring, rotary switch and auto-transformer starters or control units. Shunt, series and compound motors and generators.

Learning Outcomes:

- Plan task and select equipment.
- Install electric machines and control gear according to worksite procedures and statutory requirements.
- Connect electric machines and control gear.
- Commission electric machines and control gear according to statutory requirements.
- Clean electric machines and control gear.
- Inspect electric machines and control gear.
- Maintain electric machines and control gear.
- Complete task by cleaning the worksite and filling in a works-register/required-documentation.

7.5 Topic 5: Safety and first aid OR Electrical entrepreneurship

7.5.1 Safety and first aid

7.5.1.1 Subject Outcome 1.1: Understand and apply safety rules.

Learning Outcomes:

- Explain why safety is of paramount importance; identify hazardous conditions; know what safety precautions to take when working in elevated positions, working with a grindstone, arc welding, drilling, using an angle grinder and when doing maintenance on electrical equipment.
- Understand and apply safety precautions when using machinery.
- Understand and apply safety requirements at a work place.
- State safety equipment that should be in place and in use, and use them correctly
- State the use and care of safety equipment (protective clothing, eyewear, footwear, electrically insulated gloves, welding protection (hood, apron, spats, gloves, barriers, guards and emergency stop switches).
- Know about the Occupational Health and Safety Act of 1993, the Mine Health and Safety Act 29 of 1996, NOSA and NOSA ratings in factories and workshops, and the SHE program.
- Explain and discuss statutory rights and responsibilities regarding safety.
- Explain and discuss safety, health and environmental goals.

- Perform safety checks at work.
- Write reports about unsafe conditions.

7.5.1.2 Subject Outcome 1.2: Understand and apply first aid.

Learning Outcomes:

- Identify the symptoms and know the treatment to apply basic first aid to an accident victim (electric shock, shock, burns, bleeding, fractures, artificial respiration and cardiac resuscitation).
- Correctly sum up the situation, organise a response and apply first aid, do all required administration.
- Know the procedures in reporting an accident.

7.5.2 Electrical entrepreneurship

7.5.2 Subject Outcome 2: Investigate the possibility of an electrical business venture.

Range: Operate a personal computer system. Demonstrate the ability to use a database for business purposes. Demonstrate knowledge of and produce word processing documents using basic functions. Demonstrate knowledge of and produce computer spreadsheets using basic functions. Investigate the possibility to establish and run a SMME (small business enterprise).

Learning Outcomes:

- Design a database that will aid you in your business venture.
- Communicate with suppliers to establish component and equipment prices and delivery procedures.
- Use spreadsheets to produce a financial layout of the proposed venture in order to assist in the decision making process.
- Identify constraints and decide if the venture is feasible.
- Establish the procedures required to register your business.
- Compose a portfolio of evidence that can be used for loan applications.
- Design an advertisement to introduce your business venture to the public.
- Design a logo, forms such as quotation and invoice and receipt forms.
- Compose a contract such as 'conditions of sale' or 'product guarantee' or 'terms in the agreement'.

8 RESOURCE NEEDS FOR THE TEACHING OF ELECTRICAL WORKMANSHIP – LEVEL 4

8.1 Physical resources

Well equipped classrooms and workshops are essential for this practical orientated subject. If possible, using the facilities of employers in the electrical field, for training, is preferred.

8.2 Human resources

Registered post level 1 or higher Educators at FET Institutions.

8.3 Financial resources

The institution should make provision for

- consumables during practicals,
- maintenance of physical resources and
- purchasing of new equipment.