



education

Department:
Education
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

SUBJECT GUIDELINES

ELECTRONIC CONTROL AND DIGITAL ELECTRONICS

NQF Level 4

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ELECTRONIC CONTROL AND DIGITAL ELECTRONICS – LEVEL 4

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INTRODUCTION

A. What is Electronic Control and Digital Electronics?

Electronic Control and Digital Electronics Level 2 covers the basics of electronics and is designed to introduce the field of learning. The assumption is made that the student has no previous electronics background. .

In levels 3 and 4, students continue with the theoretical and practical implementation of the learning material. Repetition of some of the work will be noticed, since the foundation of knowledge is important.

B. Why is Electronic Control and Digital Electronics important in the Electrical Infrastructure Construction programme?

Electronic Control and Digital Electronics transfers the necessary trade-specific skills, knowledge, values and attitudes for students to understand, maintain, repair and construct basic electronic systems in practice.

C. The link between the Learning Outcomes for Electronic Control and Digital Electronics and the Critical and Developmental Outcomes

This subject covers a substantial portion of the practical knowledge component of the exit level outcomes. The application of this subject is OBE orientated and relates to the Critical and Developmental Outcomes. Students will be taught to:

- Identify and solve problems:
 - Recognise situations that require action and react appropriately.
- Work effectively with others:
 - Construct and test projects in groups or teams.
- Organise and manage themselves and their activities:
 - Apply the correct 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 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 content.

D. Factors that contribute to achieving the Electronic Control and Digital Electronics Learning Outcomes

- An understanding of technical (electro-mechanical) principles
- 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.

Students with special education needs (LSEN) must be catered for in a way that eliminates barriers to learning.

2 SUBJECT LEVEL FOCUS

- Apply safety precautions and demonstrate procedures when replacing electronic components
- Demonstrate an ability to read technical manuals
- Construct timing, filter and oscillator circuits and explain their operation
- Demonstrate an ability to understand binary code
- Demonstrate an ability to load software on a computer and troubleshoot associated problems
- Design and fault-find simple control systems

3 ASSESSMENT REQUIREMENTS

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

3.1.1 Theoretical Component

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

3.1.2 Practical Component

The practical component will form 40 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 Programme*.

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 set externally and marked and moderated internally.

External assessment details are set out in the *Assessment Guidelines: Electronic Control and Digital Electronics (Level 4)*.

4 WEIGHTED VALUES OF TOPICS

TOPICS	WEIGHTED VALUE
1.1 Replacing faulty components and using technical manuals (section 1)	20%
1.2 Timing, filter, oscillator and inverting circuits (section 1)	30%
2.1 Binary Coding (section 2)	10%
2.2 Loading software and troubleshooting associated problems (section 2)	10%
3. Synchro-server motors and operation of PLCs (section 3)	30%
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 AND LEARNING OUTCOMES

On completion of Electronic Control and Digital Electronics Level 4 the student should have covered the following topics:

Topic 1:	Replacing faulty components on a PC board and basic design procedures
Topic 2:	Binary decoding and loading software onto a computer
Topic 3:	Operating PLCs

7.1 Topic1: Replacing faulty components on a PC board and basic design procedures

7.1.1 Subject Outcome 1: Apply safety precautions and demonstrate procedures when replacing components.

Learning Outcomes:

- Demonstrate safety procedures followed when soldering and desoldering on a PC board and on viro board.
- Demonstrate the manual dexterity needed to remove and replace a variety of components on a PC board.
- Demonstrate precautions taken when handling circuit boards containing MOSFET components.

7.1.2 Subject Outcome 2: Demonstrate the ability to read and interpret semi-conductor manuals.

Learning Outcomes:

- Show how to find any semi-conductors operational limits by using technical manuals.
- Interpret the data found in technical manuals.
- Show how to look up replacement parts in technical manuals

7.1.3 Subject Outcome 3: Construct basic electronic circuits.

Range: Includes components such as resistors, capacitors, inductors, diodes, transistors and analogue op-amps. Mounting can be done on viro board.

Learning Outcomes:

- Describe the uses, application and functioning of timing circuits.
- Describe the uses, application and functioning of filter circuits.
- Describe the uses, application and functioning of oscillator circuits.
- Describe the uses, application and functioning of an inverting power supply with the aid of a block diagram.
- Demonstrate the ability to design, construct and test timing, filter and oscillator circuits observing the appropriate safety precautions and using the appropriate test equipment.

7.2 Topic 2: Binary decoding and loading software onto a computer

7.2.1 Subject Outcome 1: Demonstrate an ability to understand binary code.

Learning Outcomes:

- Name a variety of weighted and complementary binary codes, binary coded decimals and alphanumeric codes.
- Prepare and produce a variety of weighted and complementary binary codes and binary coded decimals.
- Interpret the decimal equivalents of any given floating point binary number.

7.2.2 Subject Outcome 2: Demonstrate an ability to load software onto a computer.

Learning Outcomes:

- Demonstrate an ability to load a variety of object-driven software onto a functioning computer.
- Explain what types of problems that can affect the proper running of computer software and explain the possible origins, cures and preventions of these problems.

7.3 Topic 3: Operating PLCs

7.3.1 Subject Outcome 1: Explain synchro-server motors.

Learning Outcomes:

- Sketch the commonly used symbols in synchro-server motors.
- Explain the operation and construction of synchro-server motors.
- List brief descriptions of applications of synchro-server motors.

7.3.2 Subject Outcome 2: Design and fault-find simple control circuits.

Learning Outcomes:

- Interpret the workings of simple ladder logic diagrams.
- Solve simple problems using ladder logic diagrams.
- Design and build simple solutions to repetitive mechanical actions using ladder logic diagrams.
- Analyse simple faults occurring in a PLC circuit.

8 RESOURCE NEEDS FOR THE TEACHING OF ELECTRONIC CONTROL AND DIGITAL ELECTRONICS – 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.